A Q U A P H Y T E

A Newsletter about Aquatic, Wetland and Invasive Plants

Center for Aquatic and Invasive Plants
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Reconstruction of *Archaefructus sinensis*
by K. Simons and D. Dilcher

New Fossil Aquatic Plant Discovered

Using the oldest, most complete fossil angiosperm on record, Dr. David Dilcher, a palaeobotanist with the Florida Museum of Natural History at the University of Florida, recently announced the discovery of a new basal angiosperm family of aquatic plant, Archaefructaceae. The announcement was published in the journal *Science* with coauthors Ge Sun of the Research Center of Palaeontology at Jilin University, Qiang Ji of the Geological Institute of the Chinese Academy of Geosciences at Beijing and three others (full citation below).

The new family consists of a single genus, *Archaefructus,* with two species, *A. liaoningensis* and *A. sinensis* sp. nov. from the Yixian Formation in Liaoning, northeastern China. The fossils are believed to be at least 124.6 million years old and possibly as old as 145 million years (corresponding with Lower Cretaceous to the uppermost Upper Jurassic periods). A specimen is deposited with the Geological Institute of the Chinese Academy of Geosciences at Beijing. Five nearly complete fossil plant specimens in various stages of reproductive maturity were examined. When all characters of the two species were analyzed using a combined matrix of morphology and molecular data, it was determined that a new family of flowering plants was required, Archaefructaceae, which should be considered a sister taxon to extant angiosperms.

The Archaefructaceae are believed to have been aquatic plants because of the long, thin, herbaceous stems that would have required water for support. The finely dissected compound leaves also suggest an aquatic habitat. In addition, the leaves have a swollen petiole base, especially the leaves closest to the reproductive organs and farthest from the base of the plant. This feature would have provided buoyancy to the plant and aided in supporting the reproductive organs above the water during pollination and possibly seed dispersal. Numerous fish (*Lycoptera davidi* Sauvage) are preserved with the fossil plants, further supporting the conclusion that Archaefructus was aquatic.

The researchers state that Archaefructus is part of a complex basal group in angiosperm evolution and does not represent the original angiosperm. They suggest that the original angiosperm may have been a submerged aquatic plant such as some Nymphaeales.

See *Science* Vol. 296 (3 May 2002):899-904, *Archaefructaceae, a New Basal Angiosperm Family* by Ge Sun, Qiang Ji, David L. Dilcher, Shaolin Zheng, Kevin C. Nixon, Xinfu Wang.

For further information, contact Dr. Dilcher at the University of Florida, Florida Museum of Natural History, POB 117800, Gainesville, FL 32611; E-mail: dilcher@flmnh.ufl.edu

Mistaken Identity?

It is easily possible to confuse the two small trees shown below. However, one is a desirable native to be left alone in Florida; the other is a highly invasive non-native in the state. Both are *Ardisia* species. Both grow in the same habitats of southern Florida. They grow to about the same height (up to 20 feet), have relatively large, leathery, simple leaves with smooth margins, and both produce hanging clusters of black fruits.

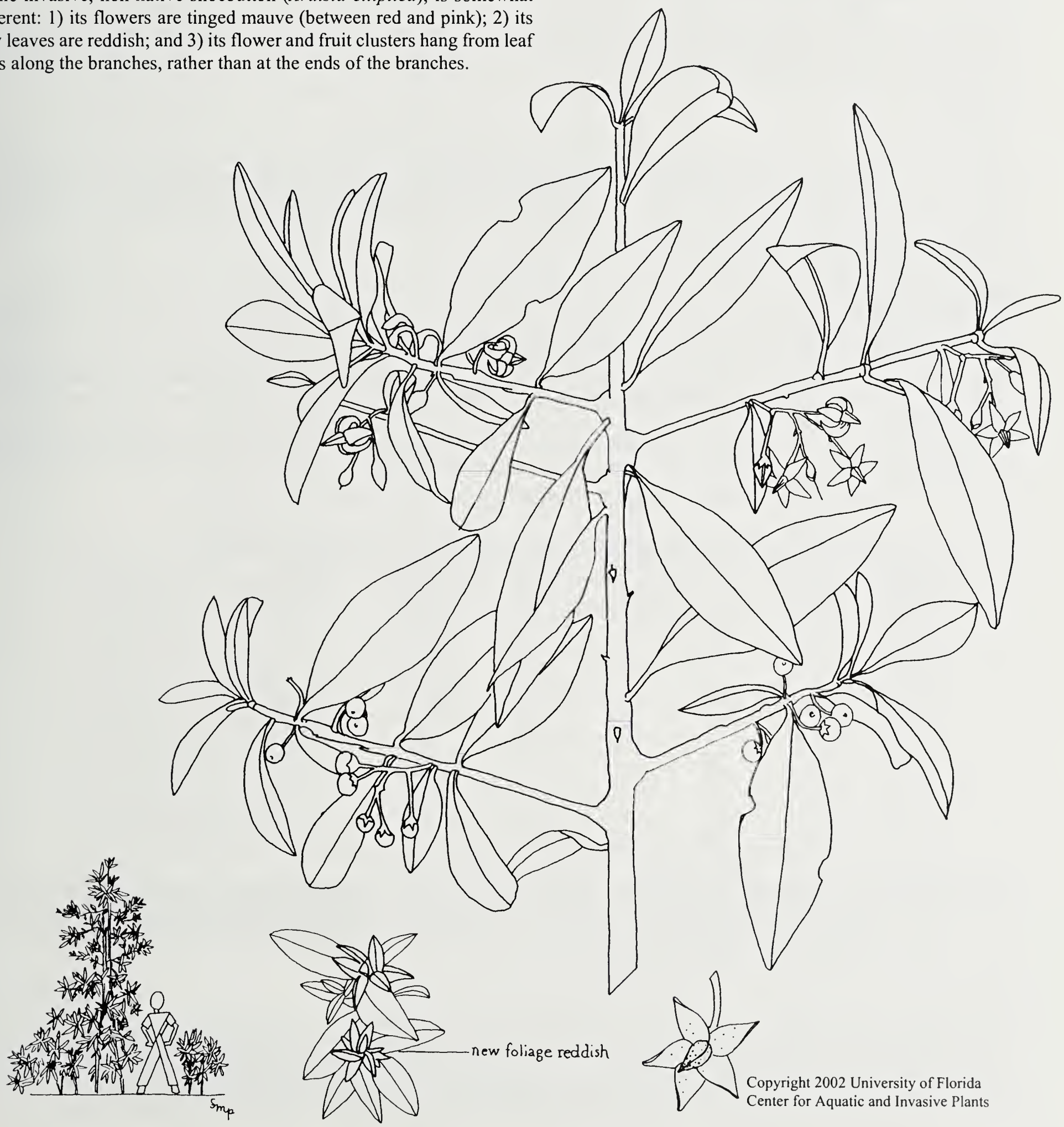
Marlberry
Ardisia escallonioides
Native in Florida

The native plant, marlberry (*Ardisia escallonioides*), is somewhat less robust and less leafy, although it may be taller, than shoebutton. Marlberry flowers and fruit clusters are terminal, hanging at the ends of branches.

These line drawings are by Sandra Murphy-Pak, Center for Aquatic and Invasive Plants, University of Florida. With proper attribution and in not-for-sale items only, please feel free to use these line drawings for manuals, brochures, reports, proposals, web sites . . . .

Shoebutton
Ardisia elliptica
Invasive non-native in Florida

The invasive, non-native shoebutton (*Ardisia elliptica*), is somewhat different: 1) its flowers are tinged mauve (between red and pink); 2) its new leaves are reddish; and 3) its flower and fruit clusters hang from leaf axils along the branches, rather than at the ends of the branches.



Macrophyte Ecology within Experimental Reed Beds Applied for Heavy Metal Removal

by Miklas Scholz, University of Bradford, School of Engineering, Environmental Water Engineering Research Group, West Yorkshire BD7 1DP, UK; E-mail: m.scholz@bradford.ac.uk

Background

Wetlands can be applied for passive treatment of diffuse pollution including mine wastewater drainage (Kadlec and Knight, 1995). The functions of macrophytes in terms of their physical effect on wetlands have been reviewed extensively (Brix, 1994). The biology of *Phragmites australis* was reviewed in 'Biological Flora of the British Isles' (e.g.; Haslam 1972). However, the role of macrophytes within complex reed bed ecosystems treating heavy metal pollution has not yet been fully reported. The aim of this paper is to compare experimental wetland filters of different composition.

Materials and Methods

Wetland habitats were simulated on a laboratory scale with six vertical-flow wetland buckets. The empty bucket volume was 59.2 dm^3. Table 1 indicates the packing order of filter media and plant roots in January 2000.

The experiment ran continuously with modified inflow water taken from a nearby beck. In order to simulate metal contamination such as may be found in process water from mining, copper sulfate and lead sulfate were added to the inflow water to give concentrations of 1.000 and 1.277 mg dm^{-3}, respectively.

The range of the hydraulic load per filter bucket was between 1.35 and 2.02 cm d^{-1} (mean: 1.91 cm d^{-1}). In June 2000, water evaporation accounted for approx. 0.08 cm d^{-1}, *Phragmites australis* evapotranspiration for approx. 0.15 cm d^{-1} and *Typha latifolia* evapotranspiration for a value between 0.12 and 0.17 cm d^{-1}.

TABLE 1. Packing order of vertical-flow filter buckets simulating wetlands.

Height (cm)	Filter 1	Filter 2	Filter 3	Filter 4	Filter 5	Filter 6
56-58	(Water/air)	(Water/air)	(Water/air)	(Water/air)	(Water/air)	(Water/air)
49-55	Water + C	Water + C	Water + C	Water + C	Water + C	Water + C
47-48	6	6 + A	6 + A + B	8 + A + B	8 + A + B	9 + A + B + Fs
41-46	6	6 + A	6 + A + B	8 + A + B	8 + A + B	8 + A + B
37-40	5	5 + A	5 + A + B	6 + A + B	7 + A + B	7 + A + B
35-36	5	5	5 + B	6 + B	7 + B	7 + B
33-34	4	4	4 + B	6 + B	6 + B	6 + B
29-32	4	4	4	5	6	6
25-28	4	4	4	5	5	5
21-24	3	3	3	4	5	5
17-20	3	3	3	4	4	4
15-16	3	3	3	3	4	4
9-14	2	2	2	3	3	3
0-8	1 + 2	1 + 2	1 + 2	1 + 2	1 + 2	1 + 2

1 = cobblestones; 2 = coarse gravel; 3 = fine gravel; 4 = pea-gravel; 5 = coarse sand; 6 = fine sand; 7 = Filtralite; 8 = activated carbon; 9 = charcoal; A = *Phragmites australis*; B = *Typha latifolia*; C = marginal, floating and submerged plants; Fs = Osmocote fertilizer

Discussion and Conclusions

Standardized set-up cost ratios in England (Spring 2000) for Filters 1 to 6 (Table 1) are 1 : 2 : 3 : 37 : 41 : 42, respectively. However, the overall reduction performance of all filters in terms of lead, copper, biochemical oxygen demand (BOD), suspended solids, turbidity and bacteria was substantially great and similar for all filters during the first five months of operation (Table 2).

TABLE 2. Filter efficiencies: reduction of parameters for Filters 1 to 6.

Performance variables (outflow water)	Inflow Water Mean	Unit	Reduction (%) per wetland filter 1	2	3	4	5	6
Lead reduction	1.4	mg dm^{-3}	98	99	99	99	99	99
Copper reduction	1.0	mg dm^{-3}	96	98	97	99	98	99
BOD	2.2	mg dm^{-3}	60	57	41	45	53	41
SS reduction	17.0	mg dm^{-3}	55	42	50	53	51	33
Turbidity reduction	2.3	NTU	95	87	68	80	97	99
DO reduction	8.5	mg dm^{-3}	46	68	74	77	72	78
THB reduction	2948	number per ml	88	98	92	94	91	88
TC reduction	368	number per ml	100	98	69	89	98	96

BOD = biochemical oxygen demand; SS = suspended solids; DO = dissolved oxygen; THB = total heterotrophic bacteria; TC = total coliforms

Table 3 presents a summary of the performance parameter for *Phragmites australis*. Filter 3 showed a relative poor performance (Tables 2 and 3) which may have resulted from a high level of plant decay indicated by mid leaf color transformation (Pavey, 1978). Shoot density was high, stem diameters were sufficiently large and leaf/stem ratios were low (Table 3). These are indicators of good general performance (defined by Haslam, 1972). The strong normal plant diameter distribution shows that the physical strength and growth performance of *Phragmites* is independent of filter media and fertilizer application. However, shading decreased the stem diameters (Haslam, 1972) of *Phragmites* growing in fertilized filter media (Table 3).

The filters containing macrophytes contributed artificially to the inflow BOD. The real inflow BOD to the filter media was, therefore, the sum of the natural inflow BOD (10 - 40%) and the BOD resulting from plant decay (60 - 90%). BOD resulting from plant decay was greatest for filters containing *Typha*. The addition of fertilizer (Filter 6 only) increased the degradation rate.

TABLE 3. Performance parameter of *Phragmites australis* for Filters 2 to 6.

Performance Parameter	Filter 2	3	4	5	6
Total plant number	54	34	48	39	72
Mean plant height (cm)	46.7	47.6	54.7	45.5	46.0
Median plant height (cm)	46.0	47.5	55.5	41.0	46.0
Leaf/stem ratio	4.66	3.62	5.65	4.44	5.68
Average node number	2.04	2.00	2.90	2.33	2.14
Average stem diameter (mm)	2.65	2.8	2.61	2.63	2.55
Average stem and branch number	1.11	1.21	1.40	1.23	1.51
Growth density (number per m^2)	434	273	386	314	579
Cluster density (number per m^2)	30	16	32	24	48
Color: plate; green variations	28.6	28.7	28.6	28.8	28.5
Color: column; intensity E (%)	30	10	30	30	20
Color: column; intensity F (%)	70	90	70	70	80
Color: row; darkness	6.3	5.5	6.6	6.6	7.0

The presence of *Phragmites* (dominant stands) and *Typha* in all reed beds does not lead to an overall increase of the wetland performance in laboratory scale experiments. Plant decay within all reed beds resulted in increases in biochemical oxygen demand and bacteria numbers within the water layer on top of the litter zone.

References

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Books/Reports

INVASIVE PLANTS AND ANIMALS: Is There a Way Out?

ed. by W. Bergmans and E. Blom. 2001. 80 pp.

(Order from Netherlands Committee for IUCN, Plantage Middenlaan 2B, 1018 DD Amsterdam, THE NETHERLANDS. Email: redacti@nciucn.nl)

This is the Proceedings of a Conference on Alien Invasive Species on the 26th September, 2000 in the National Museum of Natural History Naturalis in Leiden, the Netherlands. Recommendations from this conference include, 1) become more active in the study of invasive species, and adopt policies; 2) set up an institution to systematically collect data on alien pest species; 3) invasive species issues should be included in the agendas of the Convention on Biological Diversity; 4) since not much is known, individual invasions should be dealt with on a case by case basis; 5) measures to counteract invasions should be taken early on; 6) biological control programs for invasive species should be "surrounded by extensive precautions"; 7) a set of fixed definitions of terms must be used; 8) set up a database on invasive species and the damage they cause; 9) necessary funds for research should be had; 10) in the Netherlands, listings are a good idea.

MEETING THE INVASIVE SPECIES CHALLENGE - National Invasive Species Management Plan,

by the National Invasive Species Council. 2001. 80 pp.

(Order from National Invasive Species Council, 1951 Constitution Avenue, NW, Suite 320, Washington, DC 20240. 202-208-6336. WWW: http://www.invasivespecies.gov)

"Despite an array of federal programs designed to stop or control them, the number of invasive species and their cumulative impacts is accelerating at an alarming rate. This Plan is an important first step for a unified and cooperative approach to address invasive species issues... The next and most difficult step will be implementation of the Plan - which is the highest and most immediate priority."

GLOBAL STRATEGY ON INVASIVE ALIEN SPECIES,

ed. by J.A.McNeely, H.A. Mooney, L.E. Neville, P.J. Schei and J.K. Waage. 2001. 50 pp.

(Order from IUCN, The World Conservation Union, Publications Unit, 219c Huntingdon Road, Cambridge CB3 0DL, UNITED KINGDOM. WWW: http://www.iucn.org)

This is the strategic plan of the Global Invasive Species Programme (GISP). GISP is "a component of DIVERSITAS, an international programme on biodiversity science". "GISP is coordinated by the Scientific Committee on Problems of the Environment (SCOPE), in collaboration with the World Conservation Union (IUCN), and CAP International," with financial support from UNEP, UNESCO, NASA, ICSU, La Fondation TOTAL, the David and Lucile Packard Foundation, the John D. and Catherine T. MacArthur Foundation, and the United States Department of State.

The strategic plan gets right to it: "The spread of Invasive Alien Species (IAS) is now recognized as one of the greatest threats to the ecological and economic well being of the planet."

The authors recommend a "consolidated action plan"; believe that, "eradication is difficult and expensive, but possible"; state that, "because the cost and benefit factor influences decisions that results in risk analysis that are often very difficult politically, the criteria for making such decisions should be clearly developed"; and "capacity building and further research on the biology and control of IAS and biosecurity issues should therefore be given attention and priority"; and "an information system regarding the biology and control of IAS is urgently needed...and the information system must be linked to the Clearing House Mechanism of the Convention on Biological Diversity." [Why, *we're* an information system on IAS.]

The "Ten Strategic Responses" include 1) build management capacity; 2) build research capacity; 3) promote information sharing; 4) develop economic policies and tools; 5) strengthen national, regional, and international legal and institutional frameworks; 6) institute a system of environmental risk analysis; 7) building public awareness and engagement; 8) prepare national strategies and plans; 9) build invasive alien species issues into global change initiatives; and 10) promote international cooperation.

BIOLOGICAL CONTROL OF WATER HYACINTH 2 - The Moths *Niphograpta albiguttalis* and *Xubida infusellus*,

by M.H. Julien, M.W. Griffiths and J.N. Stanley. 2001. 91 pp.

(Order from Australian Centre for International Agricultural Research (ACIAR), GPO Box 1571, Canberra ACT 2601, AUSTRALIA. ACIAR Monograph No. 79.)

This monograph treats these two biological control moths, their biologies, host ranges, and rearing, releasing and monitoring techniques. But it also treats, with updated information, the plant's morphology, distribution, habitat and impact. It includes much detailed information about the life histories of the water hyacinth stem borer and the water hyacinth stalk borer, host-range testing for the two insects, and introductions and effects. What follows is a very detailed, step-by-step description of how to rear these insects and then how to release them and evaluate their hyacinth-destroying effects. All sections are copiously illustrated with excellent color photographs.

BIOLOGICAL AND INTEGRATED CONTROL OF WATER HYACINTH (*Eichhornia crassipes*),

ACIAR Proceedings NO. 102, ed. by M.H. Julien, M.P., Hill, T.D. Center and Ding Jianqing. 2001. 152 pp.

(Order from Australian Centre for International Agricultural Research (ACIAR),GPO Box 1571, Canberra ACT 2601, AUSTRALIA.)

This contains the proceedings of the Second Meeting of the Global Working Group for the Biological and Integrated Control of Water Hyacinth, Beijing, China, 9-12 October 2000. The group consists of 31 delegates from 11 countries. The proceedings include 22 papers on the subjects, including reviews of and new work with arthropods and pathogens, with case studies from China, South Africa, Malawi, Rwanda, Egypt, Kenya, Zimbabwe and Tanzania.

GARDENING WITH CARNIVORES - Sarracenia Pitcher Plants in Cultivation and In The Wild, by N. Romanowski. 2002. 106 pp.

(Order from University Press of Florida, 15 NW 15 ST, Gainesville, FL 32611-2079. $29.95 (paperback). WWW: http://www.upf.com)

Pitcher plants (*Sarracenia*) are native to the southeastern U.S. This is "the first complete guide to these ornamental plants, from natural history to hybridization, and from creating a bog garden to using the pitchers as long-lasting cut "flowers"." It is a nicely produced book, and includes a number of full-size color pages of these interesting plants. The book includes 80 color photos, 8 drawings and a bibliography.

A PLAGUE OF RATS AND RUBBER-VINES - The Growing Threat of Species Invasions, by Y. Baskin. 2002. 377 pp.

(Order from Island Press. WWW: http://www.islandpress.org)

"We must make no mistake: we are seeing one of the great historical convulsions in the world's fauna and flora." Charles Elton, 1958. Presenting a slightly different take on the subject, this science writer includes in the book a useful list of her themes: a) we are all in this together...; b) my intent is not to condemn...; c) the language is value-laden...; d) migration and dispersal are natural processes, but...; e) many invaders benefit or please someone...; f) unfortunately, this isn't "a war that can be won once and for all"...; and g) we can't unscramble, but we can work to preserve the native biodiversity we still have.

What she presents isn't simply a list of invasion factoids, one after the other, as in so many of the current crop of books of similar title. Hers is more a very long essay - the author informs the factoids with anecdotes and writings of explorers of centuries past, and of great scientists who years ago rang the first alarms about species invasions.

She concludes, "This homogenization of the life of the earth leaves us poorer, whatever the head count."

FLOODPLAIN FLORA - A flora of the coastal floodplains of the Northern Territory, Australia, by I.D. Cowie and P.S. Short, and illustrated by M. Osterkamp Madsen. Supplementary Series No. 10. 2000. 382 pp.

(Order from Australian Biological Resources Study, GPO Box 787, Canberra ACT 2601, AUSTRALIA. $60.00 (soft cover). WWW: http://www.ea.gov.au/biodiversity/abrs)

From the Flora of Australia Supplementary Series, this book is an identification manual for more than 300 species of the seasonally inundated coastal floodplains (including the billabongs and lagoons) of the Top End of the Northern Territory. The book contains an overview of the floodplains origins; flora and vegetation groups; fauna; aboriginal use; and management and conservation issues. The main part of the book includes descriptions, illustrations and keys. Nearly all species are illustrated with large, well-printed drawings. Also included are numerous excellent photographs (including a spectacular aerial shot of what feral water buffalo can do to floodplain plants). Other works in the Supplementary Series treat the algae, the mosses, the lichens and allied fungi, and others.

WILD RIVERS - Discovering the Natural History of the Central South Island, by N. Peat and B. Patrick. 2001. 142 pp.

(Order from International Specialized Book Services, Inc., 5824 NE Hassalo ST,Portland, OR 97213-3644. $49.95 (soft cover). WWW: http://www.isbs.com)

South Island is in New Zealand. Central South Island is along its eastern shore on the Pacific. Although this book is "strewn with" scientific names and common names, including Maori names, it is a most readable one. What else the book is strewn with is full-page breathtaking photographs of river basins and mountain ranges; grasses and buttercups alongside icy melted glaciers; cushion plants, crack willows and braided rivers. The book concludes with an essay on conservation issues such as invasive species, from the Central South Island point of view.

RARE PLANTS OF SOUTH FLORIDA: Their History, Conservation and Restoration, by G.D. Gann, K.A. Bradley and S.W. Woodmansee. 2002. 1056 pp.

(Order from The Institute for Regional Conservation, 22601 SW 152 AVE, Miami, FL 33170. $49.95 (paperback). WWW: http://www.regionalconservation.org)

This work is based on the research program, the Floristic Inventory of South Florida. It includes information on several hundred imperiled plants and includes detailed information on their known history in the state, according to historical surveys and herbaria, their current status, their major threats, and useful comments. Also included are floristic status reports for a large number of south Florida conservation areas. For example, in this book one will learn that in Big Torch Key Parcels 884 and 885 (67.19 acres), there are 19 "listed" plants (and they are listed), and 6 FLEPPC exotic plants.

As one reviewer raves about this huge production, "They have produced a permanent reference point against which future plant restoration efforts will be judged. For the first time, there is a comprehensive, regional rare flora that incorporates restoration recommendations for each of several hundred critically-imperiled species alongside general advice and a status report on conservation areas."

SEDGES: Carex, by R.H. Mohlenbrock, illustrated by P. Nelson. 1999. 328 pp.

(Order from Southern Illinois University Press, PO Box 3697, Carbondale, IL 62902-3697. $59.95. 1-800-346-2680. WWW: www.siu.edu/~siupress)

This book is the fourteenth volume in the *Illustrated Flora of Illinois* series and the sixth and last volume devoted to monocots. Each of the 159 species of *Carex* is precisely illustrated, showing growth habit and the key plant structures used for identification. More than three-fourths of the Illinois *Carex* species occur in wetlands, and useful range maps show distribution by county in this state. Detailed descriptions and a key complete the guide to this confusing genus.

Continued - next page

LAKESCAPING FOR WILDLIFE AND WATER QUALITY, by C.L. Henderson, C.J. Dindorf and F.J. Rozumalski. 2001. 176 pp.

(Order from Minnesota's Bookstore, 117 University Avenue, Saint Paul, MN 55155. 1-800-657-3757. $24.95 (softcover).)

What a very nice high-value book, and from a government agency, no less: the Nongame Wildlife Program of the Minnesota Department of Natural Resources. This state is well known for its large number of lakes and rivers, and there, like elsewhere, the water's edge is where many people want to be. This book helps the homeowner understand how to live on the water's edge by explaining the values of wild plants and wild animals and demonstrating the unhappy eco-consequences of overdevelopment, overfertilization and overmowing. It also takes the next important step: the book competently helps the homeowner design a lakeshore landscape that is not only very appealing to humans but also abides by the state's eco-recommendations and requirements meant for wildlife and water quality. For example, in many pictures and many colorful site plans, citizens are shown how leaving a buffer zone between their homes and the open water solves many problems, ecologic and aesthetic.

How reassuring it is that in Minnesota there is the expertise and talent to put together such a helpful book for the homeowner, and that there is the will to pay for its (expensive) production and publication.

BIODIVERSITY IN WETLANDS: Assessment, Function and Conservation - Vol. 2, ed. by B. Gopal, W.J. Junk and J.A. Davis. 2001. 311 pp.

(Order from Backhuys Publishers, PO Box 321, 2300 AH Leiden, The Netherlands. US$76.00. Euro 80.00 Email: backhuys@backhuys.com. WWW: www.backhuys.com)

This book, Volume 2 of the 2000 publication of the same name, covers biodiversity in wetlands around the world, from the French river Rhone to the lower Danube, from fen landscapes in the Netherlands to coastal plain wetlands of Southwestern Australia. Other chapters explore East Africa; South America; the world's largest floodplain wetland, the Pantanal do Mato Grosso in Brazil; a Ramsar site in India, Keoladeo National Park; afrotropical wetland invertebrates, and the role of monsoons in South Asian wetlands.

BUSH INVADERS OF SOUTH-EAST AUSTRALIA - A Guide to the Identification and Control of Environmental Weeds Found in South-East Australia, by A. Muyt. 2001. 304 pp.

(Order from R.G. and F.J. Richardson, PO Box 42, Meredith, Victoria 3333, Australia. $A59.95 plus S/H. Email: richardson@weedinfo.com.au WWW: www.weedinfo.com.au)

This well-produced and finely illustrated book is both a field guide and a control manual for invasive plant species in South-East Australia. It can be useful outside this area, however, since many of the species covered are invasive elsewhere. For instance, both South-East Australia and Florida share invasive species such as *Lonicera japonica* (Japanese honeysuckle), *Macfadyena unguis-cati* (Cat's claw creeper), *Lantana camara* (lantana), *Salvinia molesta* (giant salvinia), and others.

The first section of the book discusses the problems of invasive plant species and explains their management and control. Multiple control methods such as drill-fill, cut-paint, frilling, and stem-scrape are described in detail and illustrated with helpful drawings and photographs. Fire, mowing, mulching and other control strategies also are discussed.

The second section serves as a weed identification guide and is grouped by grasses, other narrowleaf herbs, broadleaf herbs, climbers and creepers, shrubs, trees and aquatics. 93 weeds are described, covering over 150 species, sub-species, varieties and hybrids. Each species treatment includes common name, origin, method of introduction, growth form, distribution, a summary of invasiveness, multiple color photographs of very good quality, diagnostic features, reproduction and dispersal, control and removal methods, similar invasive species and confusing indigenous species (where applicable).

Free Videos Available

APIRS has a very limited number of educational video tapes available that are in the **PAL** format. We would like to send these videos to worthy research institutions, universities, or libraries, free of charge. Following is a list of the video tape sets available. We will ship one set (category) of videos to the first people to contact us and we will pay for the shipping. We will only ship one set/category to any institution.

Category: Herbicide Application

Aquatic Pest Control Applicator Training, Part 1 & 2
How To Determine Areas and Amount of Aquatic Herbicide to Use
Calibration - A Field Approach

Category: Aquatic Plant Identification Series

Floating and Floating-Leaved Plants
Submersed Plants, Part 1&2
Grasses, Sedges and Rushes, Pt 1&2

Category: Miscellaneous

Maintenance Control of Aquatic Weeds
Florida's Aquatic Plant Story
Hormone Induced Spawning of Grass Carp

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Please include a brief description of your institution and your intended use of the videos.

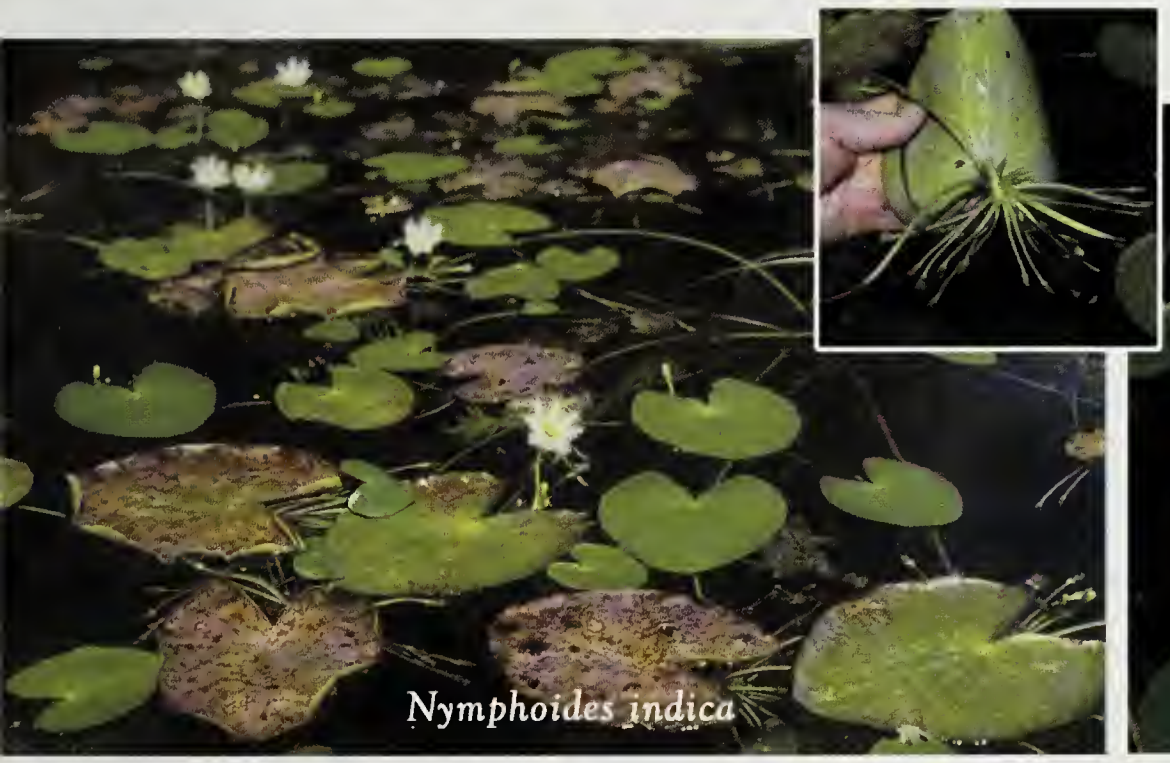
Florida's floating-hearts


Nymphoides aquatica

Know *Nymphoides*

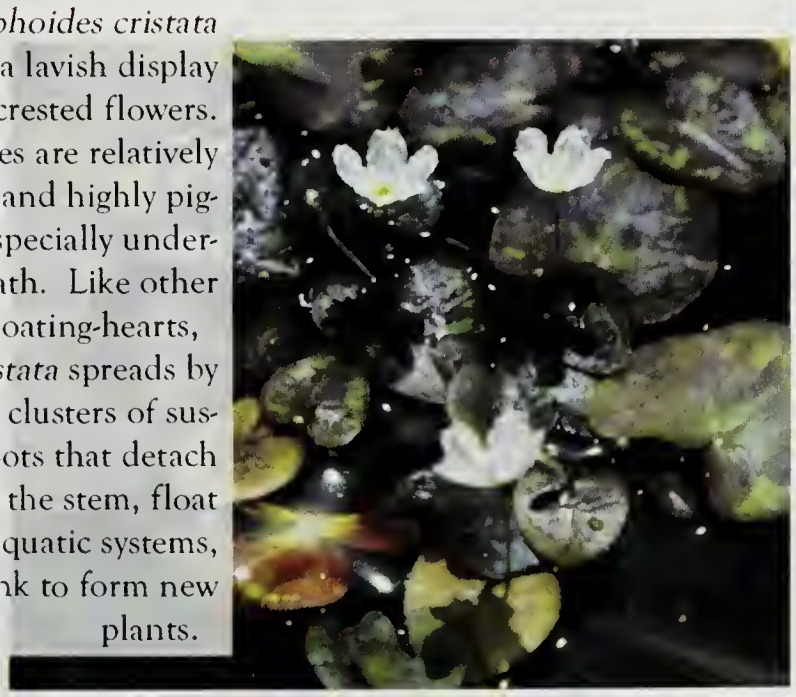
Floating-hearts (*Nymphoides*) are an attractive group of water plants with heart-shaped leaves and small, airy flowers. Two species are native to Florida; one frequent throughout the state, the other found only in the Panhandle. Unfortunately, two weedy, introduced floating-hearts are spreading in peninsular Florida. Know these *Nymphoides* with the photos below and the key to their identification on the reverse page.

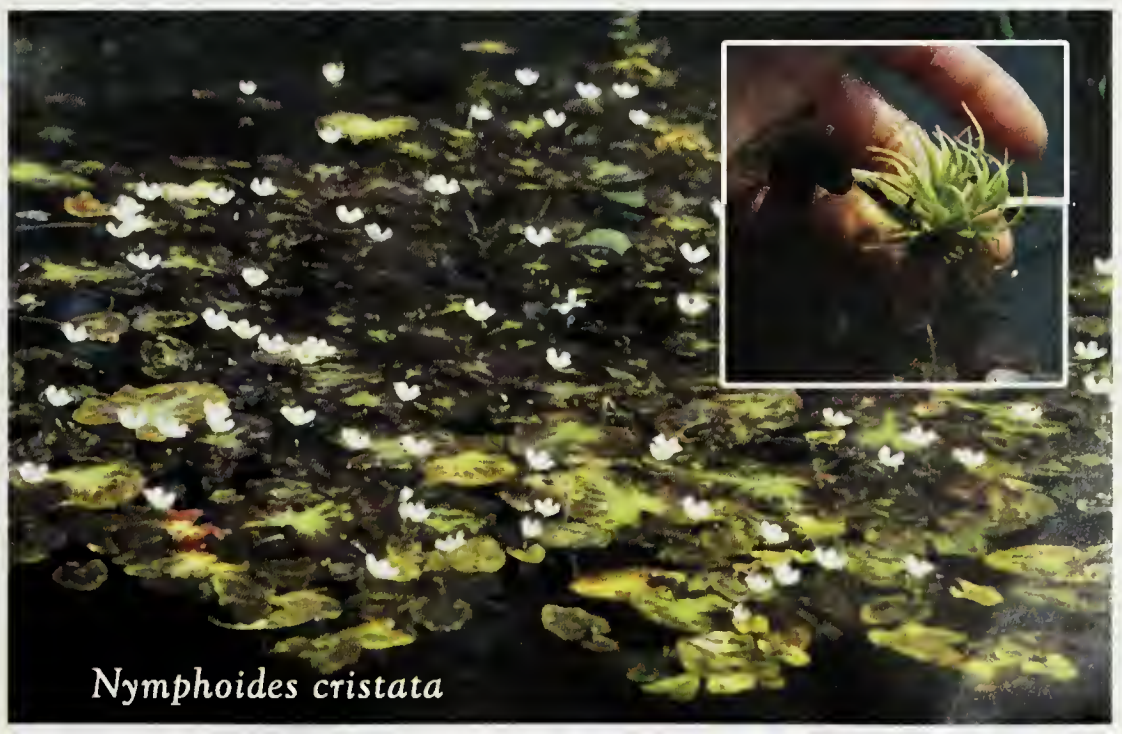
Nymphoides grow rooted in quiet waters. The leaves resemble those of water lilies (*Nymphaea*). However *Nymphoides* have rounded, not angled, leaf bases and produce smaller flowers that are carried above the water surface on slender stalks. *Nymphoides* species generally look alike, having olive-green leaves, prominent leaf veins and thick root bunches suspended below the flower stalks. Their leaves may be mottled with purple above and pebbled in texture below. Flowers are essential to identify the various species.


Nymphoides indica

Nymphoides indica is widely distributed through the world tropics where especially large plants often occur in great abundance. Leaves are almost as broad as they are long, thick, fleshy, and colored green underneath. Flowers may be white or yellow. Petals are furry and range in number from 4 to 8.

Nymphoides cristata produces a lavish display of ruffled, crested flowers. Its leaves are relatively thin and highly pigmented, especially underneath. Like other floating-hearts, *N. cristata* spreads by stout clusters of suspended roots that detach from the stem, float through aquatic systems, and sink to form new plants.




Nymphoides cristata

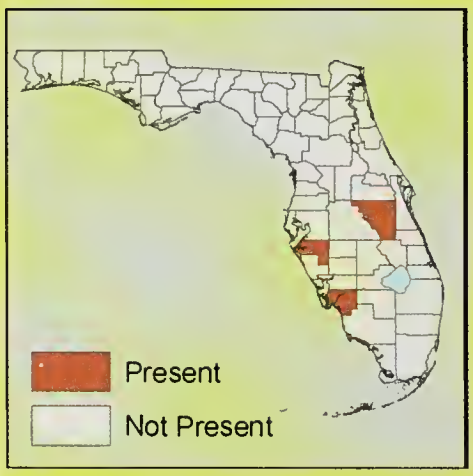
LOOK INSIDE THE FLOWERS ... to separate the introduced floating-hearts from the Florida natives ...

1. Flowers densely covered with hair on the inner surface; flowers 2.5 - 3.7 cm wide . . . . . *Nymphoides indica*
1. Flowers without hair (excepting a few radiating from center); flowers 0.75 - 2.4 cm wide . . (2)

2. Petals bearing a ruffled crest (like a rooster's comb) down the center . . . . . *Nymphoides cristata*
2. Petals without a median, ruffled crest . . . . . (3)

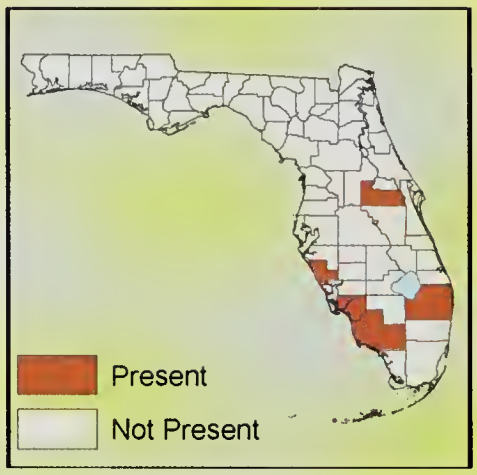
3. Leaf undersurface rough, veins prominent; leaves to15 cm long; plants larger, sturdy *Nymphoides aquatica*
3. Leaf undersurface smooth; leaves to only 7 cm long; plants smaller, delicate . . . . . *Nymphoides cordata*

Nymphoides indica
Water snowflake
INTRODUCED



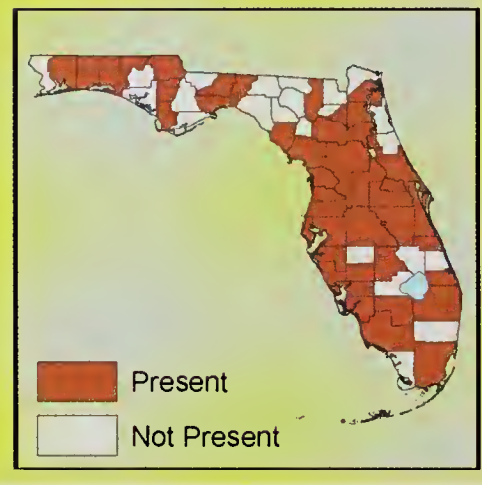
Nymphoides indica is known from-limited, scattered introductions in Florida. First recorded at the Braden River, Manatee Co. in 1983, it has since appeared at a natural wetland in Osceola Co. and a Lee Co. pond.

Nymphoides cristata
Crested floating-heart
INTRODUCED



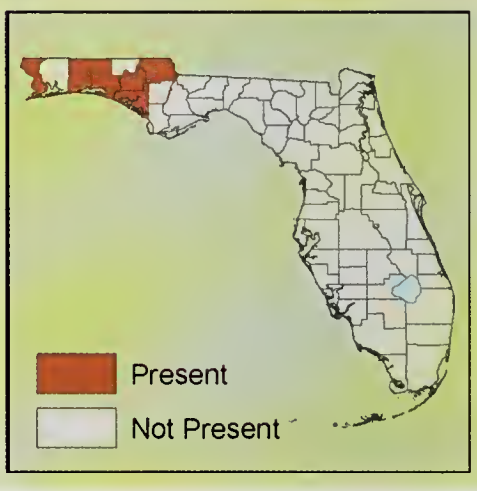
Abundant populations of *Nymphoides cristata* are increasing in distribution. Early introductions included a Lee Co. cypress swamp in 1997. South Florida canal systems and a central Florida lake (Orange Co.) have since been invaded.

Nymphoides aquatica
Big floating-heart
NATIVE



Nymphoides aquatica ranges naturally through much of Florida, and the South, where it flowers from spring through fall. Although the petal margins are ruffled, its inner surface is unadorned.

Nymphoides cordata
Little floating-heart
NATIVE



Drought conditions kept *Nymphoides cordata* hard to find this spring in its Panhandle range. Florida is the southern extent of it's native easterly distribution, which stretches north to Maine.

May 2002

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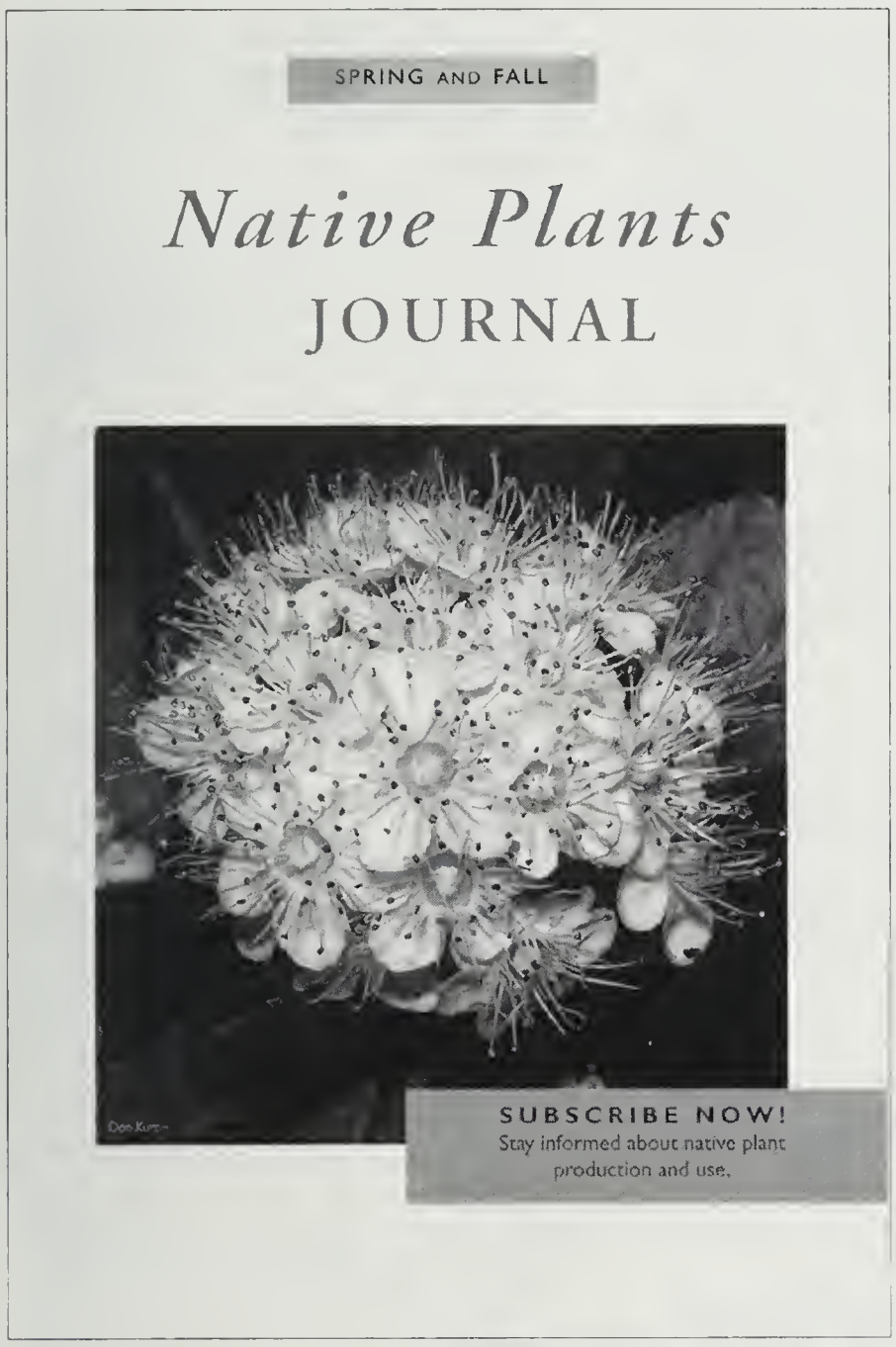


Native Plants Journal

***Native Plants* Journal** is a cooperative effort of the USDA Forest Service and the University of Idaho, with assistance from the USDA Agricultural Research Service and the Natural Resources Conservation Service. Our goal is to provide technical and practical information on the growing and planting of North American (Canada, US, and Mexico) native plants for restoration, conservation, reforestation, landscaping, roadsides, and so on. Our first issue was printed in January 2000.

We need contributions from scientists, academics, field personnel, nursery managers, and others concerning all aspects of growing and planting native plants. Papers are published either refereed or general technical. Please contact Kas Dumroese (kdumroese@fs.fed.us) if you have a contribution.

Native Plants Network

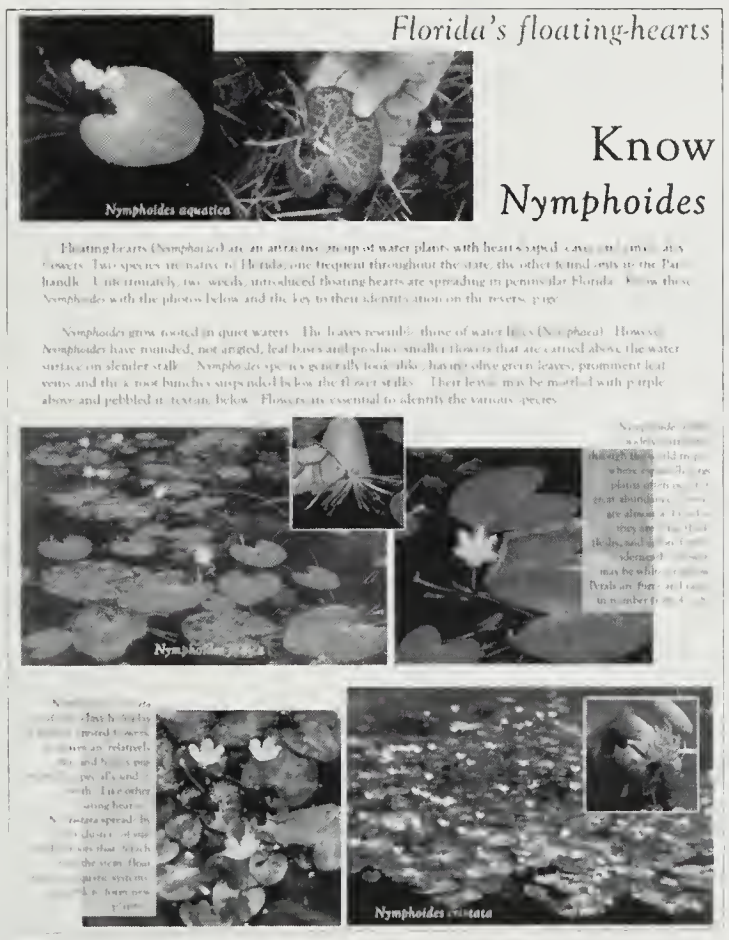
The **Native Plants Network** is devoted to the sharing of information on how to propagate native plants. Feel free to search the database for species you have interest in, and please take the time to upload protocols of species you successfully grow. You will receive full credit for your entry and have the opportunity to add your company logo to the protocol. If you would like to share some propagation techniques, entry is easy using the Protocol Interface.

For more information, go to: http://nativeplants.for.uidaho.edu/

Know *Nymphoides*

Frequently non-native invasive plants look very similar to desirable native plants. Managers and citizens ask, "How do you tell them apart? Which should we promote and which should we destroy?"

Included with this issue of **AQUAPHYTE** is a very nice color ID flyer that demonstrates which two *Nymphoides* species in Florida are native and which two species are non-native. The flyer was written by USGS botanist, Colette Jacono. Its printing and distribution was funded by two herbicide companies: SePRO and Helena Chemical Company.



Download your own copy: **http://www.fcsc.usgs.gov/Nonindigenous_Species/nymphoides.pdf**

FROM THE DATABASE

Here is a sampling of the research articles, books and reports which have been entered into the aquatic, wetland and invasive plant database since Winter 2001.

The database contains more than 57,000 citations. To receive free bibliographies on specific plants and/or subjects, contact APIRS using the information on the back page or use the database online at http://plants.ifas.ufl.edu/

To obtain articles, contact your nearest state or university library.

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The Collection of Aquatic and Wetland Plants of the Czech Republic

by **Lubomír Adamec** and **Stepán Husák**, Institute of Botany of the Academy of Sciences of the Czech Republic, Section of Plant Ecology, Dukelská 135, CZ-37982 Trebon, Czech Republic, adamec@butbn.cas.cz, husak@butbn.cas.cz

The Collection of Aquatic and Wetland Plants (CAWP) was started in 1976 as a living collection of Czechoslovak aquatic higher plant species as part of the Section of Plant Ecology of the Institute of Botany at the Academy of Sciences of the Czech Republic (known as the Department of Hydrobotany before 1987). Research has been conducted continuously at the Institute in the fields of ecophysiology, production ecology, geobotany, phytosociology, and taxonomy of higher aquatic and wetland plants (and also algae). It became necessary to establish a limited plant collection to aid in this research.

The range of species in the Collection has widened markedly since its establishment. In 2001, about 350 species, hybrids, or cultivars were kept in the CAWP. The dominant majority of these species (>90 %) are indigenous in the Czech Republic; the others are mainly from Central Europe. Thus, the CAWP is focused on aquatic and wetland temperate plant species of Central Europe; the proportion of subtropical species or species from other continents is marginal. Taking into account the great number of items kept in the CAWP, it is evident that it is by far the greatest collection of native aquatic and wetland plants in Europe and one of the greatest in the world.

Many dozens of native aquatic and wetland plants can usually be found in several distinguished botanical gardens in Western Europe but the collection in such gardens is mainly focused on conspicuous ornamental species. The CAWP contains both higher plants and Charophytes (stoneworts). All ecological forms of aquatic and wetland plants are represented in the collection: rooted and rootless submersed, floating-leaved, free floating, and emergent plants, perennial species as well as annuals. The CAWP contains all Czech carnivorous plant species and many bog and fen plant species. Very common, as well as critically endangered, rare plant species are part of the Collection; some of the endangered plant species are almost extinct in the Czech flora. Importantly, the CAWP also contains species which were extinct in the Czech flora in the last decades (e.g., *Aldrovanda vesiculosa, Pilularia globulifera, Typha minima*). In spite of the continuous renewal of species in the CAWP, approximately 15-30 susceptible plant species may be lacking from the species list every year. The species most difficult to keep are aquatic annual species, lemnids, or those growing mostly in cold running waters (e.g., *Ranunculus* subgenus *Batrachium* spp.). A specific section of the CAWP is represented by ephemeral plants growing in wet denuded soils. These species (e.g., *Centunculus minimus, Illecebrum verticillatum, Coleanthus subtilis, Cyperus flavescens, Juncus capitatus, J. tenageia*) belong to the most endangered taxa not only in the Flora of the Czech Republic but also in Europe and to species most rapidly vanishing from natural sites. Some of them are grown and reproduced with difficulty.

Although for practical reasons the CAWP is not open to the general public as a botanical garden, our purpose has been to make the Collection accessible to as many specialists and students as possible. Every year, the staff guides dozens of school excursions through the CAWP, including primary school pupils, inland and foreign university students and staff, and participants of the UNESCO Training Course on Limnology. Moreover, the CAWP serves as a gene pool for rare and endangered species, provides plant material for experiments and studies, comparative material for determinations and botanical illustrations, and is used for the teaching of botany and plant ecology. Also, conservation-based (i.e., rescue) cultivations of ca. 30 endangered species originated with plant specimens from the CAWP. Plants of 17 species from these cultivations have been used for reintroductions mostly to the Trebonsko Biosphere Reserve in the last six years. In addition to the CAWP, a (sub)tropical carnivorous plant collection (ca. 55 species) is situated in a heated greenhouse.

The CAWP covers an area of ca. 0.04 ha. The temperate-zone plants are grown outdoors, while the several (sub)tropical species are in a heated greenhouse. Each plant species is usually grown in plastic pots, which are put in bigger containers. Robust helophyte species (e.g., reeds, cattails, sedges) grow individually in smaller plastic containers. All plastic containers are sunken and embedded in the ground to minimize thermal fluctuations, both in summer and winter. Smaller aquatic *Utricularia* species grow in 3-l miniaquaria floating in cooling water of a big container. Their winter buds (turions) overwinter in small flasks in a refrigerator. Rooted aquatic plants growing in deeper containers (65 cm) overwinter under water. During periods of frost, ice cover in these containers may be up to 40 cm thick but the dominant majority of aquatic plants survive these conditions without being damaged. Frost-sensitive (sub)Atlantic species (e.g., *Pilularia globulifera, Littorella uniflora, Luronium natans*) are overwintered for safety in a cool compartment of a greenhouse. During the summer, seasonal shading by wooden bands protects the plants from overheating and reduces the growth of filamentous algae. Nevertheless, the growth of filamentous algae (mainly of genera *Oedogonium, Cladophora, Spirogyra*) is a crucial problem for growing submersed species. The only effective control is to repeatedly remove the mats gently and with patience by hand. On summer days, pH values in some containers may exceed 10 due to algal photosynthesis. We sometimes add ethanol (ca. 10-20 μl.l-1) or starch (ca. 20 mg.l-1) to the containers to decrease high pH by enhanced respiration. Soft tap water is used for watering the plants. In helophytes, sandy substrates are renewed every 2-3 years. One technical assistant and two curators (authors of this paper) look after the CAWP.

Using the Collection

We welcome interested colleagues to the Section of Plant Ecology at Trebon and are glad to guide them through our Collection and conservation-based cultivations. Our plant material may be offered for exchange to other plant collections or sent to colleagues

MEETINGS

EUROPEAN WEED RESEARCH SOCIETY 11TH INTERNATIONAL SYMPOSIUM ON AQUATIC WEEDS. September 2-6, 2002. Moliets et Maâ (Landes), France.

Papers are invited for the following sessions: biology and ecology of aquatic plants; relations with other abiotic and biotic components of aquatic ecosystems; invasive aquatic plants; bio-indication methods involving aquatic vegetation; management and conservation of aquatic plants; integrated management; uses of water plants. Contributions on other aspects of the biology, ecology and management of aquatic plants will also be considered. English-French simultaneous translation will be made.

Contact: Cemagref, Unité de Recherche Qualité des Eaux, 50 Avenue de Verdun, 33612 CESTAS CEDEX, France. E-mail: ewrs.2002@bordeaux.cemagref.fr

22ND INTERNATIONAL SYMPOSIUM, NORTH AMERICAN LAKE MANAGEMENT SOCIETY (NALMS). October 30 - November 1, 2002. Anchorage Hilton and Westmark Hotel, Anchorage, Alaska.

The theme of the Alaska meeting is "Staking our claim in the comprehensive management of our lakes and reservoirs." Topics in fisheries, monitoring, landscaping, impacts, legislation, limnology, remote sensing, and economic values are suggested.

Contact: Pam Leasure, Program Chair, Telephone: 727/464-4425; E-mail: pleasure@co.pinellas.fl.us NALMS web site: http://www.nalms.org

26TH ANNUAL MEETING, FLORIDA AQUATIC PLANT MANAGEMENT SOCIETY. November 13-15, 2002. Adam's Mark Resort, Daytona Beach.

Primarily for field personnel, this meeting offers presentations on all methods of aquatic plant management, herbicide updates, equipment demonstrations, and more.

Contact: John Rodgers, Program Chair, Dept. Environmental Protection, 8302 Laurel Fair Circle, Suite 140, Tampa, FL 33610; 813/744-6163; E-mail: john.rodgers@dep.state.fl.us

8TH CONFERENCE OF THE CONTRACTING PARTIES TO THE RAMSAR CONVENTION. November 18-26, 2002. Valencia, Spain.

The theme: "Wetlands: water, life, and culture". Ramsar member countries meet once every three years to assess the progress of the Convention and wetland conservation, share knowledge and experience, and plan their work of the next three years. The meeting will be held in the world-famous Science Museum Principe Felipe (designed by Santiago Calatrava). The technical sessions are: 1: Wetlands - major challenges and emerging opportunities in the new century; 2: Wetland inventory and assessment; 3: Practical steps for applying the vision for the Ramsar list of Wetlands of International Importance; 4: Managing wetlands for sustainable use: lessons learned and new perspectives; and 5: Cultural aspects of wetlands as a tool for their conservation and sustainable use.

Contact: Ramsar Convention Bureau, Rue Mauverney 28, CH-1196 Gland, Switzerland; Telephone: +41 22 999 0170; FAX: +41 22 999 0169; E-mail: ramsar@ramsar.org WWW: http://www.ramsar.org/index_cop8.htm

DETECTING & ASSESSING INVASIVE EXOTIC PLANTS: APPROACHES FOR THE FLORIDA LANDSCAPE. February 12-14, 2003. Florida International University, Koven's Conference Center, Miami.

A conference and workshop. "This workshop will bring together experts working in the field of vegetation detection, assessment and analysis to present their work, technology and methods to a blue-ribbon panel of experts in the fields of GIS, remote sensing, species detection and identification, landscape ecology and spatial analysis." Sponsored by the Noxious Exotic Weed Task Team (NEWTT), Florida International University, the South Florida Water Management District, and the US Army Corps of Engineers.

Contact: Rafaela Monchek, E-mail: rmonchek@sfrestore.org WWW: http://www.sfrestore.org/issueteams/exotic/iepda/IEPDAindex.htm

3RD IOBC GLOBAL WORKING GROUP MEETING ON BIOLOGICAL AND INTEGRATED CONTROL OF WATER HYACINTH. August 2003. Uganda.

Presented by the Working Group on Water Hyacinth of the International Organisation for Biological Control of Noxious Animals and Plants (IOBC).

Contact: Dr. James Ogwang, PO Box 7084, Kampala, Uganda; E-mail: jamesogwang@hotmail.com or Dr. Martin Hill, University of Rhodes, Zoology/Entomology, PO Box 94, Grahamstown 6140, South Africa; E-mail: m.p.hill@ru.ac.za

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abroad for study purposes. The complete species list of the CAWP is available on request by e-mail to the curators, or online at the CAWP web site at www.butbn.cas.cz Please send us your species list.

In our species list, all species are classed within three groups. A) species bearing seeds or spores more or less regularly; it is possible to mail them in the form of seeds or spores; B) species which may be mailed in vegetative form (turions, rhizomes, tubers, bulbs, parts of clones, shoots); C) problematic species which are difficult to grow and, thus, are not always at our disposal; they may be represented e.g. by annual terophytes, which do not set seeds in the CAWP, lemnids, and some other susceptible species.

Since 1998/1999, the seeds of CAWP (ca. 120-200 items) have been listed in the *Index Seminum* which is regularly issued by the Institute of Botany at Pruhonice (see www.ibot.cas.cz).

We would prefer your visit and personal selection and transport of the plants to their mailing by post. Simply, we look forward to communication and cooperation with you!

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ADDRESS SERVICE REQUESTED

AQUAPHYTE

This is the newsletter of the Center for Aquatic and Invasive Plants and the Aquatic, Wetland and Invasive Plant Information Retrieval System (**APIRS**) of the University of Florida Institute of Food and Agricultural Sciences (IFAS). Support for the information system is provided by the Florida Department of Environmental Protection, the U.S. Army Corps of Engineers Waterways Experiment Station Aquatic Plant Control Research Program (APCRP), the St. Johns River Water Management District and UF/IFAS.

EDITORS: Victor Ramey
Karen Brown

AQUAPHYTE is sent to managers, researchers and agencies in 71 countries around the world. Comments, announcements, news items and other information relevant to aquatic and invasive plant research are solicited.

Inclusion in *AQUAPHYTE* does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.

Photograph of the oldest, most complete fossil angiosperm on record, *Archaefructus sinensis* sp. nov., from northeastern China.

See page 1

A Q U A P H Y T E

A Newsletter about Aquatic, Wetland and Invasive Plants

Center for Aquatic and Invasive Plants
with support from
The Florida Department of Environmental Protection,
Bureau of Invasive Plant Management
The U.S. Army Corps of Engineers,
Waterways Experiment Station,
Aquatic Plant Control Research Program
The St. Johns River Water Management District

UNIVERSITY OF FLORIDA
Institute of Food and Agricultural Sciences

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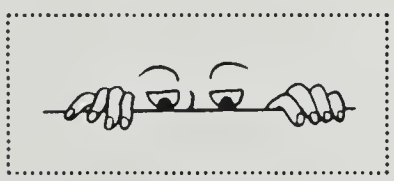
Over The Top!

http://plants.ifas.ufl.edu

During the summer of 2002, the APIRS web site attained a cyber milestone: we now receive more than *1 million hits per month.* ("Hits" are defined as pages viewed.) We know this because our brand new Sun/Unix dual processor server tells us so. It also tells us that most people access our web site on Tuesdays between 11 AM and 2 PM. (Nonetheless, about 120,000 hits/month occur between midnight and 4 AM: pings from our users on the other side of the planet no doubt.) The most popular pages on our 7,000-page web site include our plant photopages (twice as many hits as any others); our line drawings pages; our Sea Grant sponsored pages; aquatic birds pages; and our online glossary.

The online APIRS database receives around 2,100 hits per month, which is quite high considering the rigmarole users must go through to use it. By January 2003, the database should be accessible through a new web-style interface that will make it easier to use.

Note:
See the new feature, **APIRS Picks**, on page 15.



Hydrilla in Guatemala

Dr. William Haller, University of Florida, Center for Aquatic and Invasive Plants, recently visited Guatemala as a USAID (United States Agency for International Development) consultant to evaluate the current status and potential problems of *Hydrilla verticillata* in that country. Following are excerpts from his final report.

The native home of hydrilla is not known with certainty. Cook reports that he believes hydrilla is native to the Indian subcontinent which is particularly rich in Hydrocharitaceae species, but is not strongly opposed to the theory that hydrilla may be native to east Africa. Hydrilla also was reported in Europe early in the 1900s, and most recently in Poland and Lithuania, but only isolated and small populations currently exist. Though classified as a single taxonomic species worldwide, recent enzymatic and DNA analyses suggest the existence of several "types" of hydrilla including monoecious and dioecious plants (Madeira et al. 1997). Hydrilla produces excessive growth, causing problems in the western hemisphere, Asia and Australia, but it is not a problem in Europe and Africa.

Dr. Margaret Dix, University del Valle, indicated that she had collected hydrilla outside the Polochic watershed in Guatemala in approximately 1990. Fishermen noted that hydrilla was first observed in Lake Izabal in approximately 2000. This date seems correct based upon the current characteristics of the distribution in Lake Izabal. Hydrilla now occurs in many locations, with some areas of growth approaching 400-500 acres in size, and other areas of less than1 acre, suggesting that hydrilla is in an early colonization mode. Likely, hydrilla was present in the watershed, in a pond or isolated area, in 1998 when flood water from Hurricane Mitch moved it into the lake.

In Florida, the "type" of hydrilla is the dioecious female plant which only produces female flowers twice a year near the fall and spring equinox. Hydrilla in Lake Izabal was flowering during early September 2002 and no rhizomes suggestive of tuber production were located. Consequently I believe that the hydrilla in Lake Izabal is the same type as that in Florida, Texas, Mexico and Panama. This could be confirmed by planting hydrilla in shallow pans in October to determine if tuber production occurs during October through April, indicative of dioecious female plants in the southern USA where hydrilla produces tubers during short day conditions (<12-13 hours of day length).

Hydrilla in Lake Izabal

Recent surveys conducted by Alejandro Arrivillaga for the Scientific Commission and CONAP (Consejo Nacional de Areas Protegidas) show over 2,000 ha (5,000 acres) currently growing in the 170,000 acre lake. The lake is sustained by several rivers, primarily the Polochic entering Lake Izabal from the west. The lake outlet to the east is a heavily populated area, the Rio Dulce, which after approximately 3-4 miles widens into the Golfete. The Golfete is a large (approximately 15,000 acre) shallow, tidally influenced area which contains a manatee preserve and is largely surrounded by public lands. Further east, the Golfete narrows

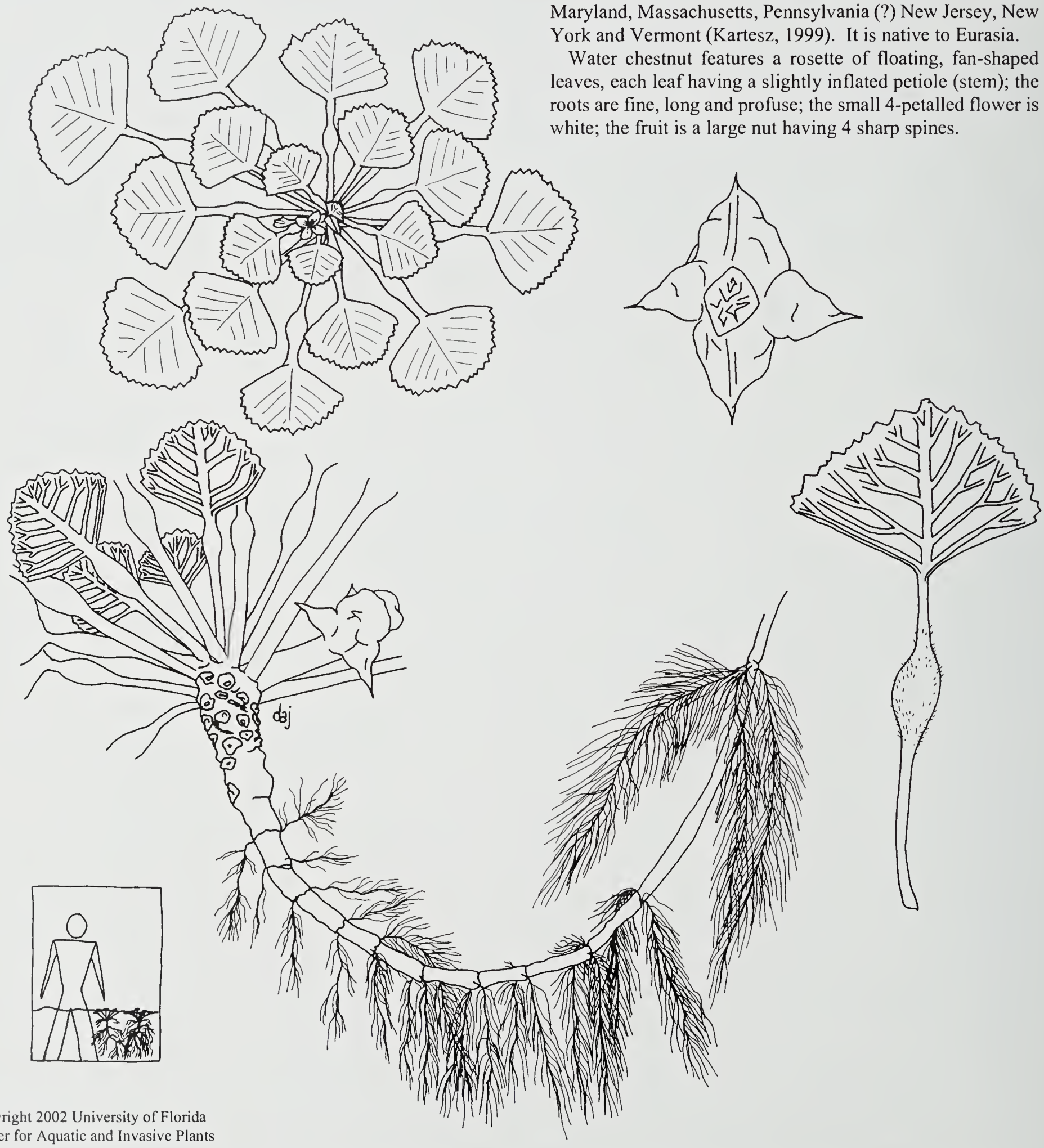
Continued on Page 5

Water chestnut, *Trapa natans*

http://plants.ifas.ufl.edu/tranat.html

This invasive non-native is present in Delaware, Virginia, Maryland, Massachusetts, Pennsylvania (?) New Jersey, New York and Vermont (Kartesz, 1999). It is native to Eurasia.

Water chestnut features a rosette of floating, fan-shaped leaves, each leaf having a slightly inflated petiole (stem); the roots are fine, long and profuse; the small 4-petalled flower is white; the fruit is a large nut having 4 sharp spines.

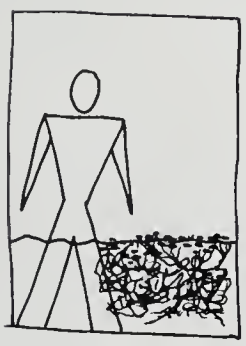


European frog-bit, *Hydrocharis morsus-ranae*

http://plants.ifas.ufl.edu/hydmor.html

This invasive non-native is present in shallow, slow-moving waters of New York, Quebec and Ontario (Kartesz, 1999). It was introduced from Europe.

European frog-bit leaves may be floating or emersed. The heart-shaped leaves are on long stems. The single 3-petalled flower is white. This plant looks similar to the native American frog-bit, *Limnobium spongia*.



This line drawing is by Dale Johnson, Center for Aquatic and Invasive Plants, University of Florida. With proper attribution and in not-for-sale items only, please feel free to use these line drawings for manuals, brochures, reports, proposals, web sites . . . .

Tempest Invades a Teapot

Following are excerpts from the *Bulletin of the Ecological Society of America* which form a dialog regarding use of the term *invader* in the field of ecology. The ESA Bulletin publishes "letters, longer commentaries, and philosophical and methodological items related to the science of ecology." The Ecological Society of America also publishes the journals *Ecology, Ecological Monographs,* and *Ecological Applications*. For more information, go to http://www.esa.org/

From "*Eight Ways to be a Colonizer; Two Ways to be an Invader: A Proposed Nomenclature Scheme for Invasion Ecology*" by M.A. Davis and K. Thompson, ESA Bulletin 81(3), July 2000, "We believe that inconsistent and imprecise use of invasion terminology is one factor that is contributing to the ongoing difficulties of the field. . . . Depending on the author, a species in the invasion literature might be referred to as *alien, exotic, invasive, nonindigenous, imported, weedy, introduced, non-native, immigrant, colonizer, native, naturalized, endemic*, or *indigenous* [references omitted-Ed.]. In many cases, these terms are not defined, or if they are defined, they are not always defined consistently. Until a commonly accepted vocabulary is adopted by invasion ecologists, we think the field will continue to have difficulty developing reliable generalizations, partly due to misunderstandings and misinterpretations among investigators. . . Clearly, an invader is not just any newcomer, but one that has a large impact on the new environment. This impact could involve community, ecosystem, and/or economic effects."

January 2001: From "*Two Ways to Be an Invader, But One is More Suitable for Ecology"* by C.C. Daehler, ESA Bulletin 82(1), "Some invading species have greater ecological impacts than others, but defining *invaders* as those species with the largest impacts is an exercise in subjectivity that will be unlikely to contribute to clarity. For ecology, defining *invader* based on population growth and spread in a new region is preferable. It captures a general ecological process that can be confirmed with simple measurements, leading to greater agreement among ecologists, and greater progress in understanding invasions as ecological phenomena."

July 2001: From "*Invasion Terminology: Should Ecologists Define Their Terms Differently Than Others? No, Not if We Want to be of Any Help!*" by M.A. Davis and K. Thompson, ESA Bulletin 82(3), "We believe that there are compelling practical and conceptual reasons for impact to be a part of the defining criteria for an invading species. The primary practical reason is that, outside of the discipline of ecology, "invasive species" are usually explicitly defined on the basis of their impact . . . it would be counterproductive to the field and to society if ecologists were to define the terms "invader" and "invasive" differently than the rest of society, and not include "impact" as part of their definitions."

April 2002: From "*Biological Invasions: Politics and the Discontinuity of Ecological Terminology*" by M. Rejmanek, D.M. Richardson, et al, ESA Bulletin 83(2), "According to these authors [Davis and Thompson], invasion always implies some kind of impact, and all "invasive" taxa are harmful. There are several problems with their proposal. . . . there is much confusion, especially in the recent literature, particularly because many newcomers to the burgeoning field of invasion ecology ignore existing terminology and instead rely on the highly emotional negative connotations of the word "invasion" in relation to war and other aggressive human activities. This is especially true for the popular literature on invasions. Unfortunately, such sloppy terminology has permeated what should be authoritative documents on this topic . . . "

July 2002: From *"Newcomers" Invade the Field of Invasion Ecology: Question the Field's Future*" by M.A. Davis and K. Thompson, ESA Bulletin 83(3), "We developed our proposed nomenclature on the explicit recognition that some new species "have a negligible effect on the new environment, whereas some have a very large impact (Davis and Thompson 2000)." We proposed that usage of the word "invasion" be confined to those circumstances in which the newcomers have a large impact on the community, ecosystem, or economy. . . . To most readers, this argument over the usage of a couple of words must seem like a tempest in a teapot. However, there may be more at stake here than just vocabulary. . . . Invasion ecology clearly has been a hot area of research in recent years, spawning invasion journals, invasion symposia, special grant initiatives, and countless books and articles on the topic. Yet, despite all this activity, very little progress in understanding the ecology of these new introductions has been gained, beyond that which could already be acquired using existing ecological models and knowledge. We fear that, despite original good intentions, the emergence of invasion ecology as a distinct subdiscipline has hindered more than helped our efforts to understand the ecology of these new introductions (Davis et al 2001). Paradoxically, ecology may contribute more constructively to society's efforts to deal with the ecological, economic, and health problems caused by some of these new species if the field proceeds without the language and paradigms promoted in invasion ecology."

Personal communication from M.A. Davis, Nov. 2002: My feeling now is that if for some reason we continue to feel compelled to use the word 'invader', it would make more pragmatic sense if we used the word in the way that the public and policy members have been using it, i.e., defined in terms of impact. However, personally, I've come to the conclusion that both scientific research and conservation efforts would be facilitated if we dropped the native/exotic/invader paradigm and language completely and referred to species as 'long-term residents' or 'recently introduced species' or 'problem species' (which can include either long-term residents or recently introduced species).

KB

Continued from Page 1

once again and passes through the "Gorges" area for approximately 4-6 miles, emptying into the Gulf of Honduras at the City of Livingston.

My visit coincided with the end of the wet season and water flows in the Rio Dulce were high with whirlpools and strong currents very noticeable wherever the river was narrow. During and for a period after the wet season, the system from the shallow Golfete through the Upper Rio Dulce is essentially fresh water, with salinities sufficiently low for hydrilla growth. (Additional data are needed on the salinity levels in the Golfete during the dry season (Nov-May)). Hydrilla was present to the water surface in the upper Rio Dulce and western Golfete during September 2002, near the end of the wet season. It is possible that salinity will control this growth during the dry season, but it appears hydrilla will become a problem in the Golfete for 2-3 months at the end of the wet season and persist until killed by saltwater intrusion in the dry season. The water depth of the Golfete appears to be suitable for hydrilla growth; the limiting factor in this area will be the effects of salinity as hydrilla cannot tolerate extended periods in excess of 6 parts per thousand or 20% of the salt concentration of seawater. The Rio Dulce east of the Golfete is too deep and too saline (I believe) for hydrilla to cause problems, though it may grow into creek deltas of inflowing fresh water in the lower Rio Dulce and interfere with local boat traffic. Research on the salinity and water depths of the Rio Dulce and Golfete will permit more accurate prediction of the future extent of hydrilla growth downstream of the Central Golfete.

Extent of Problem

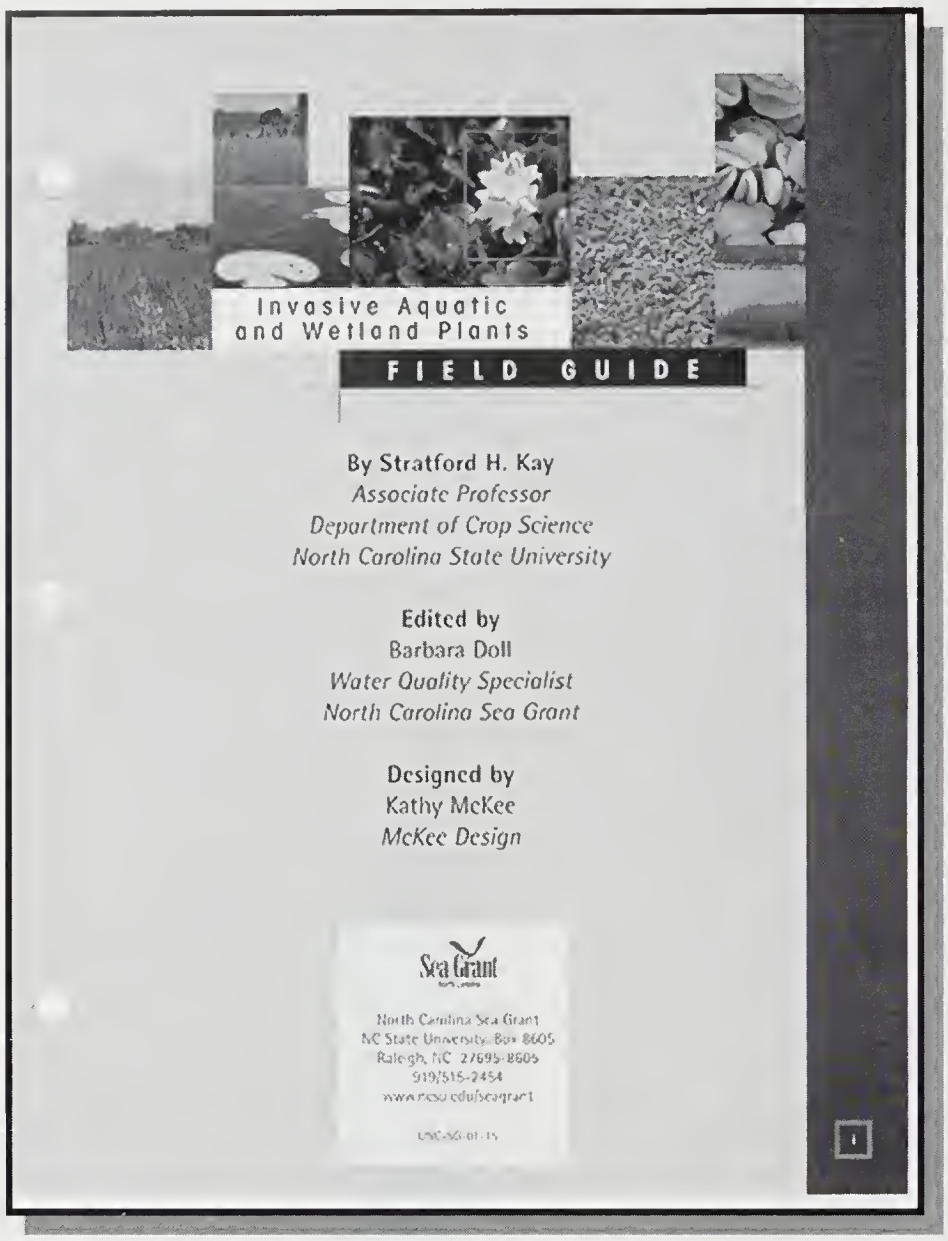
At the current level of infestation, primarily in beds in Lake Izabal, hydrilla is causing relatively minor problems to fishing and transportation. Hydrilla is currently growing to water depths of approximately 15 feet. If hydrilla continues to expand to cover the 15-18 foot contour of the lake bed, it is estimated that it will cover 10-15% of the lake surface (20-30,000 acres of the 170,000 acre lake). While this level of infestation may appear small, it will cause access and navigation problems for villagers and create problems for fisherman.

The major concern I envision is if hydrilla were to establish in the upper Rio Dulce, near the river bridge, where marinas, transportation, and tourism would be severely impacted. Many people in this area rely upon river transport for commerce, and tourism and recreation is a significant industry. Though water flow in this area is high during the wet season, flows are negligible during the dry season which will permit hydrilla to become established in these shallow waters. In fact, hydrilla beds have already been found in the upper Rio Dulce and western Golfete. The Golfete provides access to the transportation and commerce center of the upper Rio Dulce and is likely to be severely impacted as well. It is in these areas, the western Golfete and the upper Rio Dulce that I fear hydrilla will cause severe economic hardship.

Hydrilla is currently too widespread to be eradicated from this system and Guatemala needs to be prepared for expansion of hydrilla into areas which will be economically affected. While we can hope hydrilla does not spread further, historically it has and likely will continue expansion.

The Scientific Committee and concerned Guatemalan officials and agencies have already initiated much needed research, monitoring, and evaluation of management options. The following information is critically needed to be able to accurately predict the ultimate effects of hydrilla: vegetation surveys; a new bathymetric map (Hurricane Mitch in 1998 may have changed the depth contours of the lake); fisheries surveys; salinity monitoring; insect surveys; herbicide acute toxicity studies; and baseline limnological studies. While the current hydrilla infestation is causing problems in the lake, it has not invaded what I consider high priority economic sites, and it is critical to be prepared for this event. This a very large and dynamic system in which it is impossible to predict with certainty the ultimate infestation.

Arundo donax
Giant reed
E-grass?
See note on page 9.



Invasive Aquatic and Wetland Plants Field Guide

by S.H. Kay; edited by B. Doll

This field guide was produced to help extension agents, regulatory and environmental agency field personnel, and plant nursery and water garden industry personnel to recognize the most invasive noxious aquatic and wetland weeds being sold and distributed in the United States. Twenty-one species are treated using color photographs and line drawings. Their origin, growth habit, ecological threat, ID characteristics, reproduction method and similarity to other plants is presented.

The guide was prepared by North Carolina Sea Grant and was funded by the U.S. Sea Grant's Aquatic Nuisance Species Research and Outreach Initiative.

The Guide is available to certain individuals by contacting North Carolina Sea Grant at North Carolina State University, 919-515-2454;
WWW: http://www.ncsu.edu/seagrant

BIOLOGY OF INLAND WATERS

Editorial Board: The Russian Academy of Sciences
Editor-in-Chief: D.S. Pavlov, Professor, Academician of Russian Academy of Sciences, Institute of Ecology & Evolution, Moscow, 117071, Russia.

The Journal was founded in 2000 by the Russian Academy of Sciences and is published quarterly.The Journal is publishing problematic, review and original papers dealing with various aspects of the biology of aquatic ecosystems, in particular flora and fauna of water bodies, biology, morphology, systematics of aquatic organisms, ecology, ecological physiology and biochemistry of aquatic animals, behaviour of aquatic organisms, their populations and communities, aquatic toxicology, biological cycles, structure and function of aquatic ecosystems, anthropogenic impact on aquatic organisms and aquatic ecosystems, protection of aquatic ecosystems and organisms, and methods of hydrobiological and ichthyological studies.

The Journal is a successor and continues traditions of the publication of the same name of the Institute for Biology of Inland Waters RAS and of the "Russian Journal of Aquatic Ecology." In the nearest future an English version of the Journal "Biology of Inland Waters" is to be published. It will contribute to better information exchange between Russian and foreign scientists. The English version of the Journal "Biology of Inland Waters" will offer foreign investigators an opportunity to obtain regular information about the scientific results of Russian colleagues. The English version of the Journal will be published by the "International Academical Publishing House Nauka/Interperiodicals." Tentative annual subscription rate (4 issues) -US$ 300-400.

Orders and inquiries regarding subscription should be addressed to Nina A. Ziminova, Executive Secretary, Institute for Biology of Inland Waters RAS, Borok, Yaroslavl, 152742, Russia; phone/fax (08547) 2-40-42, e-mail: isdat@ibiw.yaroslavl.ru
WWW: http://www.ibiw.yaroslavl.ru/eng/jour.htm

Odds 'n' Ends

Teaching Points* available.** Created especially for science teachers, eco-trainers and others responsible for answering questions and presenting basic information about invasive plants and native plants, the ***Teaching Points is a four-page list of questions and answers that may be adapted for use in a 50-minute classroom-style presentation. So that this useful document might be used over and over, year after year, it is printed on plastic paper. The ***Teaching Points*** are even more meaningful when used in conjunction with the plant photo-murals (described next). Available free-of-charge from **APIRS, varamey@nersp.nerdc.ufl.edu**

Murals Aplenty. During the past 12 months, nearly 2,500 K-12 science teachers around the U.S. have requested and obtained free copies of the two giveaway photo-murals produced by the University of Florida and the Florida Department of Environmental Protection. The laminated photo-murals, *Invasive Non-Native Plants* and *Native Freshwater Plants*, feature many "classroom size" photos. Used with the accompanying ***Teaching Points***, science teachers may tailor their own science lessons about invasive plants for students of any grade. Besides being free to K-12 teachers, they also are for sale to anyone else. **http://plants.ifas.ufl.edu**

The St. Louis Declaration. "To curb the use and distribution of invasive plant species," these are rules to live by for nurserymen, plant sellers, botanic gardens, landscape architects and the gardening public, as promulgated and agreed upon by nurserymen, plant sellers, botanic gardens, landscape architects and members of the gardening public. Read your own Code of Conduct at **http://www.mobot.org/iss**

Oklahoma Aquatic Weeds Poster. A new poster, *Don't Free Lily! - An Aid For the Responsible Handling of Aquatic Plants*, depicts and describes Oklahoma's 23 Prohibited Aquatic Plant Species. It also shows recommended native species which should be used instead. It was produced by the Oklahoma Department of Wildlife Conservation, Langston University, and the University of Oklahoma. To obtain a free copy of the poster, contact Gene Gilliland, Oklahoma Fishery Research Laboratory, 500 E. Constellation, Norman, OK 73072; ggillokla@aol.com

Acting Locally. The Wolf River Conservancy is one of the original eco-advocacy groups of its kind. Established in 1985, the goal of its 1,500 members is "to establish a protected public greenway along the 90-mile Wolf River from its headwaters near Holly Springs, Mississippi, to its mouth at the Mississippi River in Memphis, Tennessee." Over the years, WRC has purchased and otherwise helped protect 8,000 acres of the river's "unmatched natural beauty and large pockets of undisturbed forest." Visit: **http://www.wolfriver.org**

Florida Keys GreenSweep. For the past three years, The Nature Conservancy has run a "volunteer-based habitat restoration initiative" in the Keys. Named GreenSweep, the volunteer workers clear invasive plants from four National Wildlife Refuges, 11 state parks, 5 CARL properties and countless municipal conservation lands. Alison Higgins, Land Stewardship Coordinator, The Nature Conservancy, POB 420237, Summerland Key, FL 33042. 305-745-8402.

Botanical Dermatology Database. This interesting and easy-to-use online database presents text and citations regarding toxicity of plants. Click on "BoDD Search Engine"; type in the word "melaleuca", retrieve a large file about the Myrtaceae, scroll down past *Eucalyptus* and *Eugenia*, and find toxicity references for six species of melaleuca. Visit: **http://bodd.cf.ac.uk/index.html**

K-12 Teachers A California Priority. When it comes to invasive species, many organizations forget to enlist the support of professional science teachers, even though it is well known that what teachers teach their students, the students teach their parents. The California Department of Food and Agriculture recognizes this simple yet effective cycle, and the Department specifically targets school teachers and classrooms in the effort to teach the public about invasive species and what to do about them.
Visit **http://www.cdfa.ca.gov/phpps/ipc/weededucation/k-12_education/k-12_ed_hp.htm**

Know Your Watershed. The stream down the street, the rain on that hillside: where does the water go? Are you sure? Call up this Purdue University web site; learn about watersheds; scroll down; type in your city, county or zip code, and see an EPA map of the watershed that you live in. **http://www.ctic.purdue.edu/KYW/KYW.html**

Izaak Walton League Rocks! One of the oldest conservation orgs in the U.S. (it was founded in 1922), the Izaak Walton League seeks to conserve, maintain, protect and restore the soil, air, woods, water and wildlife of the United States. Among other activities, it has strong initiatives in *Save Our Streams* and in the *American Wetlands Campaign*. For information, visit: **http://www.iwla.org**

New England Invasives. This web site maintains the *Invasive Plant Atlas of New England*, a place to report and retrieve sightings, and to download distribution maps. The Atlas is in its early stages, but much technical effort has been put into its preparation. With continued user participation, this *Atlas* promises to be a first-rate resource in the fight against invaders: **http://invasives.eeb.uconn.edu/ipane**

250 ft. long native plant mural. The City of Titusville (FL) has taken yet another approach to public education by painting a plant mural on a 250 ft. retaining wall alongside a city street. The mural illustrates the plant communities of Florida's various ecosystems; each plant is labeled with its common name. The wall is used as a teaching aid for various conservation outreach programs, including encouraging the use of native plants and Florida-friendly landscaping techniques to reduce water use. It is located at 2836 Garden Street, Titusville, Florida. For more information, contact Maureen Phillips at maureen.phillips@titusville.com

V.R.

Books/Reports

A GLOBAL COMPENDIUM OF WEEDS, by R. P. Randall. 2002. 905 pp.

(Order from R.G. and F.J. Richardson Publishers, PO Box 42 Meredith, Victoria 3333, Australia. Hardbound, $110.00 plus $40 S/H. ISBN 0-9587439-8-3. WWW: http://www.weedinfo.com.au)

This book is a compilation of 300 published lists of documented plant weediness from throughout the world. More than 18,000 plants are listed. Its purpose is "to give a weed risk assessor a condensed report of the status of a species with further avenues for finding more information." In this book, for example, you will find that *Annona glabra*, the highly desirable pond apple of the Florida Everglades, is a weed in other parts of the world. To find out where pond apple is a weed, the reader must acquire and read the publications cited as numbers 3, 76, 86, 87, 88, 98, 107, 155, 191, 230 and 268.

FRESHWATER WETLANDS AND THEIR SUSTAINABLE FUTURE - A case study of Třeboň Basin Biosphere Reserve, Czech Republic, edited by J. Květ, J. Jeník and L. Soukupová. 2002. 495 pp.

(Published by UNESCO. Order from Parthenon Publishing Group, One Blue Hill Plaza, POB 1564, Pearl River, New York 10965.)

For about 700 years, the people of the Třeboň area have created fish ponds, dams and canals, grew and cut down trees, dug up peat, and otherwise eliminated large areas of natural wetlands. Then in the 1970s, the Třeboň Basin Biosphere Reserve came into being: literally a patchwork of 33 individual "nature reserve/ monuments," most of which are wetlands.

This is an apparently exhaustive review of the literature about the Biosphere Reserve, including 40 papers about topics including hydrobiology, plants, birds, fish, eutrophication, primary production, evapotranspiration, and future prospects for the area.

WEEDS WON'T WAIT! The Strategic Plan for Managing Florida's Invasive Exotic Plants, by R.F. Doren. Four parts: I. An Assessment, 271 pp.; II. The Strategy, 90 pp.; III. Assessment Executive Summary, 16 pp.; IV. Strategic Plan Executive Summary, 17 pp. No Date.

(Published by South Florida Ecosystem Restoration Task Force, Florida International University. ISBN 0-9718804-0-9. Available as a CD or PDF file: http://www.sfrestore.org)

This is a report on the most invasive plants in Florida, "their status, distribution, management and regulation." It uses plain language in a question/answer format to summarize the responsibilities of the many key players in Florida's fight against invasive plants, and also presents a variety of control programs and results.

APPLIED AQUATIC ECOSYSTEM CONCEPTS, by G.L. Mackie. 2001. 744 pp.

(Order from Kendall/Hunt Publishing Co., Customer Service, 4050 Westmark Drive, Dubuque, IA 52004-1840. Phone: 800-228-0810.)

According to the author, this text book is meant to show how to ***"apply"*** water concepts such as lake morphometry, nutrient cycles, dissolved gases, biological assessment, water quality, biodiversity. . .The large-format, many-paged, almost-encyclopedic work is an unusual construction which combines full-blown erudition ("apparently some epipelic algae are capable of supplementing photosynthetic growth by heterotrophic utilization of organic materials"), with detailed descriptions of novel field applications ("the paper weight method is great for determining areas of any shape"), with perhaps hundreds of "how to-s": "by the end of this chapter you will know the effects of acidification on zooplankton" or ". . . how to use 18 macroinvertebrates metrics to assess water quality of rivers." It represents an enormous effort, presenting a huge variety of information. It contains no photographs, but does have a number of drawings and quite a few graphs.

AQUARIUM PLANTS, by C. Kasselmann. 2003. 528 pp.

(Order from Krieger Publishing Co., POB 9542, Melbourne, FL 32902-9542. Hardbound, $84.50. ISBN 1-57524-091-2. Phone: 800-724-0025. WWW: http://www.krieger-publishing.com)

This is the long-awaited English translation of the German book. It is a nicely-made book which describes temperature, water, fertilizer and light needs of more than 300 aquarium plants. Ecological factors, flower biology and morphology, and reproduction methods are discussed. The book contains 525 color photographs.

MAUVAISES HERBES DES CULTURES, by J. Mamarot. 2002. 560 pp. In French.

(Published by ACTA, BP 90006, 59718 Lille Cedex 9, France. 53 Euros plus S/H. WWW: http://www.acta.asso.fr)

This is a very well designed and produced field identification manual for 207 of the most important crop weeds in France. Two full pages are devoted to each plant, and include excellent, large, color photos of the plants as seedlings and as adults. Full descriptions are enhanced by 600 very clear line drawings.

Traditional dichotomous keys may be used to key-out adult plants in the usual way. And easy-to-use graphical keys enable users to key-out seedlings according to cotyledon. The manual is completed by a glossary and scientific/common name index.

VASCULAR FLORA OF ILLINOIS, by R.H. Mohlenbrock. 2002. 490 pp.

(Published by Southern Illinois University Press, POB 3697, Carbondale, IL 62902-3697. ISBN 0-8093-2421-0 $50.00 plus S/H. WWW: http://www.siu.edu/~siupress)

More than 3,100 species are keyed-out in this, the third edition of this book. It includes nearly 300 more species than did the 1986 edition. For each plant, the flowering time, general habitat and Illinois distribution are noted. There are no pictures or drawings. A glossary and indexes are included.

PLANTAS ACUÁTICAS DE LAS LAGUNAS Y HUMEDALES DE CASTILLA-LA MANCHA, by S. Cirujano, L. Medina and M. Chirino. 2002. 340 pp. In Spanish.

(Published by Real Jardin Botanico, CSIC, Madrid. Order from Distribuidora Literaria, Camino Boca Alta naves 8 y 9, Poligono El Malvar, 28500 Arganda del Rey, Spain. Phone: +34 91 42030 17, ext. 208. $33,84 plus S/H)

The Castilla-La Mancha is a region in the center of Spain. This exceptional large format book is about the aquatic plants and the different types of lakes and wetlands there. More than 140 aquatic plants are described by nice color photos and many full-page line drawings, along with distribution maps of Castilla-La Mancha. Lakes and wetlands are pictured with very good large color scenics and are described by their physico-chemical data, botanical history and problems related to their conservation. The book makes extensive use of cross- section drawings of plant zonation in the various lakes and wetlands.

THE FRESHWATER ALGAL FLORA OF THE BRITISH ISLES - An Identification Guide to Freshwater and Terrestrial Algae, edited by D.M. John, B.A. Whitton and A.J. Brook; Includes a Photo-CD by P.V. York, D.M. John and L.R. Johnson. 2002. 702 pp.

(Published by Cambridge University Press, 40 West 20th Street, New York, NY 10011-4211. ISBN 0-521-77051-3. $125.00 plus S/H. WWW: http://www.cambridge.org)

This is "the first modern account and identification guide to more than 1700 out of a total of over 2200 species of freshwater algae (excluding diatoms) in the British Isles, the majority of which also have a worldwide distribution." The book includes non-technical descriptions and hundreds of line-drawings of identifying features. The accompanying CD-ROM photo catalog features more than 500 color photos of the algae and their habitats. The CD is nicely organized and operates through your Internet browsers; the pictures are rather small.

THE EAST AFRICAN GREAT LAKES: LIMNOLOGY, PALAEOLIMNOLOGY AND BIODIVERSITY, edited by E.O. Odada and D.O. Olago. 2002. 586 pp.

(Published by Kluwer Academic Publishers, 101 Philip Drive, Morwell, MA 02061. ISBN 1-4020-0772-8 $138.00 plus S/H.)

This represents the Proceedings of the Second International Symposium on the East African Lakes held in January 2000. The lakes include Lakes Malawi, Albert, Edward, Victoria, Naivasha and Tanganyika, and the volcanic crater lakes of Ethiopia. Papers discuss the geologic history of the lakes, climate dynamics including rain and temperature tables, hydrology, fisheries, paleoenvironment and human impacts. Holocene vegetation changes in Lake Victoria also are discussed.

RURAL AQUACULTURE, edited by P. Edwards, D.C. Little and H. Demaine. 2002. 358 pp.

(Published by CAB International. Order from Oxford University Press, 2001 Evans Road, Cary, NC 27513. 800-451-7556. WWW: http://www.cabi-publishing.org)

This book "represents a real advance in understanding of the nature and scope of aquaculture and development in Asia, particularly as it affects poorer families and communities." The chapters are based on papers presented at the Fifth Asian Fisheries Forum in November 1998, and cover rice-fields, rice-fish culture, rice-prawn-fish culture, and fish seed production, as well as discussions of social aspects and development models.

THE ILLUSTRATED FLORA OF ILLINOIS GRASSES - *Bromus* to *Paspalum*, by R.H. Mohlenbrock. 2nd ed. 2002. 416 pp.

(Published by Southern Illinois University Press, POB 3697, Carbondale, IL 62902-3697. ISBN 0-8093-2359-1 $60.00 plus S/H. WWW: http://www.siu.edu/~siupress)

As in other "second editions" from this series, the original keys are left in their first edition pages, along with the original plant descriptions and distribution maps; rather than integrate new information into the first edition and its keys, new partial keys for 22 new discoveries, along with nomenclatural changes and distribution additions, are tacked on at the end of the book. This book is not easy to use. For each new species, a full-page illustration is provided.

Is *Arundo donax* "e-grass" ?

The front page of the *Wall Street Journal* recently featured an article entitled, *Arundo Has Two Lives: A Pest in California, a Boon to Florida* (Wed., October 16, 2002). The article, about *Arundo donax*, giant reed, states that "Environmentalists here [in Florida] see the plant as a godsend, offering a fast-growing replacement for coal and wood products without gouging the earth or chopping down forests." The article goes on to explain that a company, Biomass Industries, "with the blessings of the Northern Florida Sierra Club," has secured a contract with Jacksonville city utilities to deliver electricity derived from the burning (gasification) of tons of giant reed. The giant reed is to be grown on an 8,000 acre *Arundo* farm on "leased land near the Everglades." Reportedly, a gasification plant will be built on the farm and the elec-tricity it produces will be transmitted from there to Jacksonville. According to the *Journal*, the eight thousand acres of *Arundo* are to be planted in Spring, 2003.

In California, there exists a "multimillion-dollar federal and state effort" to rid the state of *Arundo*, which is listed in the A-1, *Most Invasive Wildland Pest Plants - Widespread* list of the California Exotic Pest Plant Council. "State officials, along with local Sierra Club chapters and other environmental groups, blame the reed for fueling wildfires, causing floods and killing fish. *Arundo* ranks near the top of the state's list of botanical pests." In Florida, it is not listed as an invasive plant, although it may be found locally around the state.

For its purposes, the *Arundo donax*-growing company's Web site and literature refers to the plant as "e-grass:" http://www.egrass.com

Team Arundo del Norte (California), a forum of local, state, and federal organizations dedicated to the control of *Arundo donax* (giant reed): http://www.teamarundo.org/

The Nature Conservancy Wildland Invasive Species Team on *Arundo donax*: http://tncweeds.ucdavis.edu/esadocs/arundona.html

Editor's note: The North Florida Sierra Club has stated that they were misrepresented in the *Wall Street Journal* article and that they "do not support the introduction of *Arundo donax* or any other species without a review . . . to understand the implications of introduction."

FROM THE DATABASE

Here is a sampling of the research articles, books and reports which have been entered into the aquatic, wetland and invasive plant database since Summer 2002.

The database contains more than 58,000 citations. To receive free bibliographies on specific plants and/or subjects, contact APIRS using the information on the back page or use the database online at http://plants.ifas.ufl.edu/

To obtain articles, contact your nearest state or university library.

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The *Spartina* invasion of San Francisco Bay.
AQUATIC NUISANCE SPECIES DIGEST 4(4):37-39. 2002.

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Physiological diversity of rhizoplane diazotrophs of the saltmeadow cordgrass, *Spartina patens*: implications for host specific ecotypes.
MICROBIAL ECOL. 42(3):466-473. 2001.

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Competition for pollination: effects of pollen of an invasive plant on seed set of a native congener.
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The life history of *Carex cespitosa*.
POLISH BOTANICAL STUDIES NO. 14, POLISH ACAD. SCI., W. SZAFER INST. BOT., KRAKOW, 60 PP. 1999.

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MEETINGS

43RD ANNUAL MEETING OF THE WEED SCIENCE SOCIETY OF AMERICA (WSSA).
February 10-13, 2003. Adams Mark Hotel, Jacksonville, FL.
February 13-14, 2003. Weeds in Natural Areas Workshop.

The scientific program will feature timely symposia, a discussion session, and poster and oral paper presentations on the latest weed science research. CCA credits will bc available in certain sessions. The workshop may be attended separately or in conjunction with the general meeting.

Contact: E-mail: wssameeting@allenpress.com or WWW: www.wssa.net/

DETECTING & ASSESSING INVASIVE EXOTIC PLANTS: APPROACHES FOR THE FLORIDA LANDSCAPE.
February 12-14, 2003. Florida International University, Koven's Conference Center, Miami, FL.

A conference and workshop sponsored by the Noxious Exotic Weed Task Team (NEWTT), Florida International University, the South Florida Water Management District, and the US Army Corps of Engineers. "Integrating and "harmonizing" agency activities, and developing compatible and interoperable methods for managing invasive exotic plants for Florida and the multibillion dollar South Florida Ecosystem Restoration Initiative."

Contact: R. Monchek, E-mail: rmonchek@sfrestore.org, WWW: http://www.sfrestore.org/issueteams/exotic/iepda/IEPDAindex.htm

NIWAW IV, THE NATIONAL INVASIVE WEEDS AWARENESS WEEK.
February 24 – 28, 2003. Washington, DC.

The week will include meetings, hosted receptions, and opportunities to talk with key agency managers from federal agencies about their national plans and priorities for helping in the war on weeds.

Contact: North American Weed Management Association (NAWMA), WWW: http://www.nawma.org/index.html

67TH ANNUAL MEETING OF THE FLORIDA ACADEMY OF SCIENCES.
March 21-22, 2003. University of Central Florida, Orlando.

There will be a special session on *Science and the Lake: Baseline Environmental Studies of Lake Okeechobee and its Watershed.*

Contact: WWW: www.floridaacademyofsciences.org

IZAAK WALTON LEAGUE'S AMERICAN WETLANDS CONFERENCE.
May 1-4, 2003. Thunderbird Hotel, Minneapolis, MN.

Information and training on a broad array of wetland issues, with a special focus on conservation of vulnerable ephemeral and isolated waters. Other topics will include public outreach, monitoring, legislative advocacy, land use planning, mitigation and wetland restoration.

Contact: WWW: www.iwla.org/sos.awm

23RD ANNUAL CONFERENCE OF THE FLORIDA NATIVE PLANT SOCIETY.
May 8-11, 2003. Fort Myers, FL.

The conference theme is *Symbiosis: The Power of Partnerships.*

Contact: WWW: http://www.fnps.org/

SOUTHEAST EXOTIC PEST PLANT COUNCIL 2003 ANNUAL SYMPOSIUM.
May 15-17, 2003. Lexington, KY.

Contact: mwilliams@mail.state.ky.us

THE AQUATIC WEED CONTROL SHORT COURSE.
May 19-23, 2003. UF/IFAS Fort Lauderdale Research and Education Center.

The short course will include plant ID, equipment demonstrations, sprayer calibration, CORE and sectional training in Aquatic, Right of Way and Natural Areas. There will be presentations on current aquatic plant management, vegetation management safety, West Nile virus, evolution of Florida lakes, and nuisance algae.

Contact: WWW: http://conference.ifas.ufl.edu/

18TH ANNUAL SYMPOSIUM, FLORIDA EXOTIC PEST PLANT COUNCIL.
June 5-6, 2003. Renaissance Vinoy Resort, St. Petersburg, FL.

Contact: WWW: www.fleppc.org

LAKESHORES 2003 - ECOLOGY, QUALITY ASSESSMENT, SUSTAINABLE DEVELOPMENT.
19-21 June 2003. Lake Constance, Germany.

We invite a broad range of experts, managers and users to join the conference, feeling at home in fields like limnology, aquatic and wetland ecology, hydrology and water resource management, nature conservancy, landscape ecology, regional planning, touristic management etc., and coming from universities, state and private research institutions, agencies, NGO's and user groups in Europe and from overseas.

Contact: Conference Bureau LAKESHORES 2003, PD Dr. Wolfgang Ostendorp, Limnologisches Institut, Universitäät Konstanz D-78457 Konstanz, Germany, E-mail: seeufer2003@uni-konstanz.de -or- lakeshores2003@uni-konstanz.de

Meetings - Continued

3RD IOBC GLOBAL WORKING GROUP MEETING ON BIOLOGICAL AND INTEGRATED CONTROL OF WATER HYACINTH. August 2003. Uganda.

Presented by the Working Group on Water Hyacinth of the International Organisation for Biological Control of Noxious Animals and Plants (IOBC).

Contact: Dr. James Ogwang, PO Box 7084, Kampala, Uganda; E-mail: jamesogwang@hotmail.com or Dr. Martin Hill, University of Rhodes, Zoology/Entomology, PO Box 94, Grahamstown 6140, South Africa; E-mail: m.p.hill@ru.ac.za

INVASIVE PLANTS IN NATURAL AND MANAGED SYSTEMS: LINKING SCIENCE AND MANAGEMENT. November 3-7, 2003. Wyndham Bonaventure Resort, Ft. Lauderdale, FL.

A joint conference and workshop, co-hosted by the Ecological Society of America and the Weed Science Society of America in conjunction with the 7th International Conference on Ecology and Management of Alien Plant Invasions.

Contact: http://www.esa.org/ipinams-emapi7/

EWRS-Aquatic Weeds 2002 meeting held in France

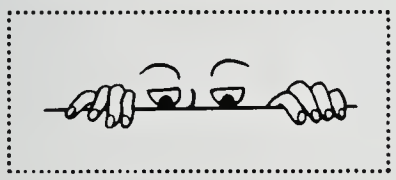
The **European Weed Research Society's 11th International Symposium on Aquatic Weeds** took place in Moliets et Maâ in the Landes region of France from 2-6 September 2002. The symposium was organized by Cemagref (http://www.cemagref.fr/), in partnership with INRA (http://www.inra.fr/) and ENSA of Rennes (http://agro.roazhon.inra.fr/), a national scientific group working on macrophytes of continental waters of France, and the Conseil Général des Landes. Previous symposia have taken place in different European countries since 1964.

Approximately 150 participants from 27 countries presented more than 100 papers at the five-day meeting. Topics ranged from biology (16 papers), environmental relationships (36 papers), bioindication (14 papers), management (17 papers), control (20 papers), and invasions (8 papers). Presentations were given in French or English, with simultaneous translation available via wireless headphones. *Hydrobiologia* will be publishing a special issue for papers presented at the symposium.

Two field trips during the meeting showcased the Basque country, the rivers of the Pyrenées Piedmont, and the lakes and wetlands of the Aquitaine coast.

The sumptuous gala dinner was preceded by a jai-alai demonstration (a traditional Basque sport), and concluded with an anonymous late paper presented by Dr. Max Wade (UK) titled "Observations of the invasion by alien aquatic weed scientists on the ecology of Moliets et Maâ, France." This fascinating paper was one of the highlights of the evening.

The 12th International EWRS Symposium on Aquatic Weeds is expected to be held in Poland. *KB*



APIRS Picks:

The most likely invaders of natural areas include aquatic or semi-aquatic plants, grasses, nitrogen-fixers, climbing plants, and clonal trees, according to an analysis of almost 2,800 agricultural weeds and natural area invaders world-wide. The analysis also found that only 25% of natural area invaders were also serious agricultural weeds.

Daehler, C.C. 1998. *The Taxonomic Distribution of Invasive Angiosperm Plants: Ecological Insights and Comparison to Agricultural Weeds.* Biol. Cons. 84:167-180.

A "greenhouse insect," *Orthezia insignis*, is a serious, non-native pest now infesting Florida landscape plants, including cultivated lantanas (*Lantana* sp.). This study compares susceptibility to this invasive insect by Florida's two native lantana species and 38 cultivars of two non-native lantana species. It was found that our native *Lantana depressa* and *Lantana involucrata* are much more susceptible to this insect threat than are any of the 38 exotic nursery cultivars.

Boschat, T.K. and Weissling, T.J. 2001. *Susceptibility of* Lantana *Cultivars to* Orthezia insignis. HortTechnology 11(3):460-462.

An endangered butterfly in the U.S. is becoming more endangered because its host plant, a wetland sedge, *Carex stricta*, is being paved over and drained by new highway and dredging projects. In 1997 only eleven populations were known; we wonder how many there are now.

Shuey, J.A. 1997. *Conservation Status and Natural History of Mitchell's Satyr,* Neonympha mitchellii mitchellii *French (Insecta: Lepidoptera: Nymphalidae).* Natural Areas Journal 17(2):153-163.

Read about "lag phase": "The promotion of new plants in the nursery trade creates an increasing incentive to only briefly evaluate and then immediately introduce new plants...It may be possible to effectively evaluate some herbaceous species in a given region within a few years, but woody plants may require twenty, thirty, or more years to effectively evaluate them."

McWilliams, E.L. and Arnold, M.A. 1998. *Horticultural History Repeating Itself: Dispersal and the Invasion Lag Phase of Exotic Plants on the TAMU Campus.* In: Proc. 10th Conf., Metropolitan Tree Improvement Alliance, St. Louis, MO, Sept 30-Oct 1, 1998.

Is this "the foundation for building a general theory of seed plant invasiveness"? The author reviews Darwin's explanation for invasion success, presents certain characteristics that may be required for invasiveness (seed size and periodicity, vertebrate availability, latitudinal range and genome size), and propounds a theory of plant invasiveness.

Rejmanek, M. 1996. *A Theory of Seed Plant Invasiveness: The First Sketch.* Biol. Cons. 78:171-181.

Watermilfoil Hybrids. DNA studies of invasive watermilfoil species reveal distinct sequences acquired from both nonindigenous and native North American species; that is, they are hybrids of native and non-native plants.

Moody, M.L. and Les, D.H. 2002. *Evidence of Hybridity in Invasive Watermilfoil (*Myriophyllum*) Populations*, Proc. National Academy of Sciences 99(23):14867-14871, November 12, 2002.

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AQUAPHYTE

This is the newsletter of the Center for Aquatic and Invasive Plants and the Aquatic, Wetland and Invasive Plant Information Retrieval System (**APIRS**) of the University of Florida Institute of Food and Agricultural Sciences (IFAS). Support for the information system is provided by the Florida Department of Environmental Protection, the U.S. Army Corps of Engineers Waterways Experiment Station Aquatic Plant Control Research Program (APCRP), the St. Johns River Water Management District and UF/IFAS.

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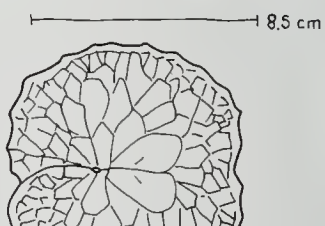
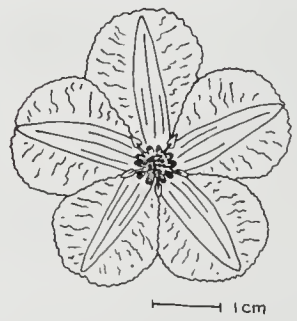
AQUAPHYTE is sent to managers, researchers and agencies in 71 countries around the world. Comments, announcements, news items and other information relevant to aquatic and invasive plant research are solicited.

Inclusion in *AQUAPHYTE* does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.

Yellow floating-heart, *Nymphoides peltata*
http://plants.ifas.ufl.edu/nympel.html

A floating-leaved plant with large yellow flowers, and adventitious roots along an underwater stem.





Introduced as an ornamental from eastern Asia, this invasive non-native in present in the states found along a diagonal line from Texas to New Hampshire, and into Quebec, also present in Arizona, California and Washington (Kartesz, 1999).